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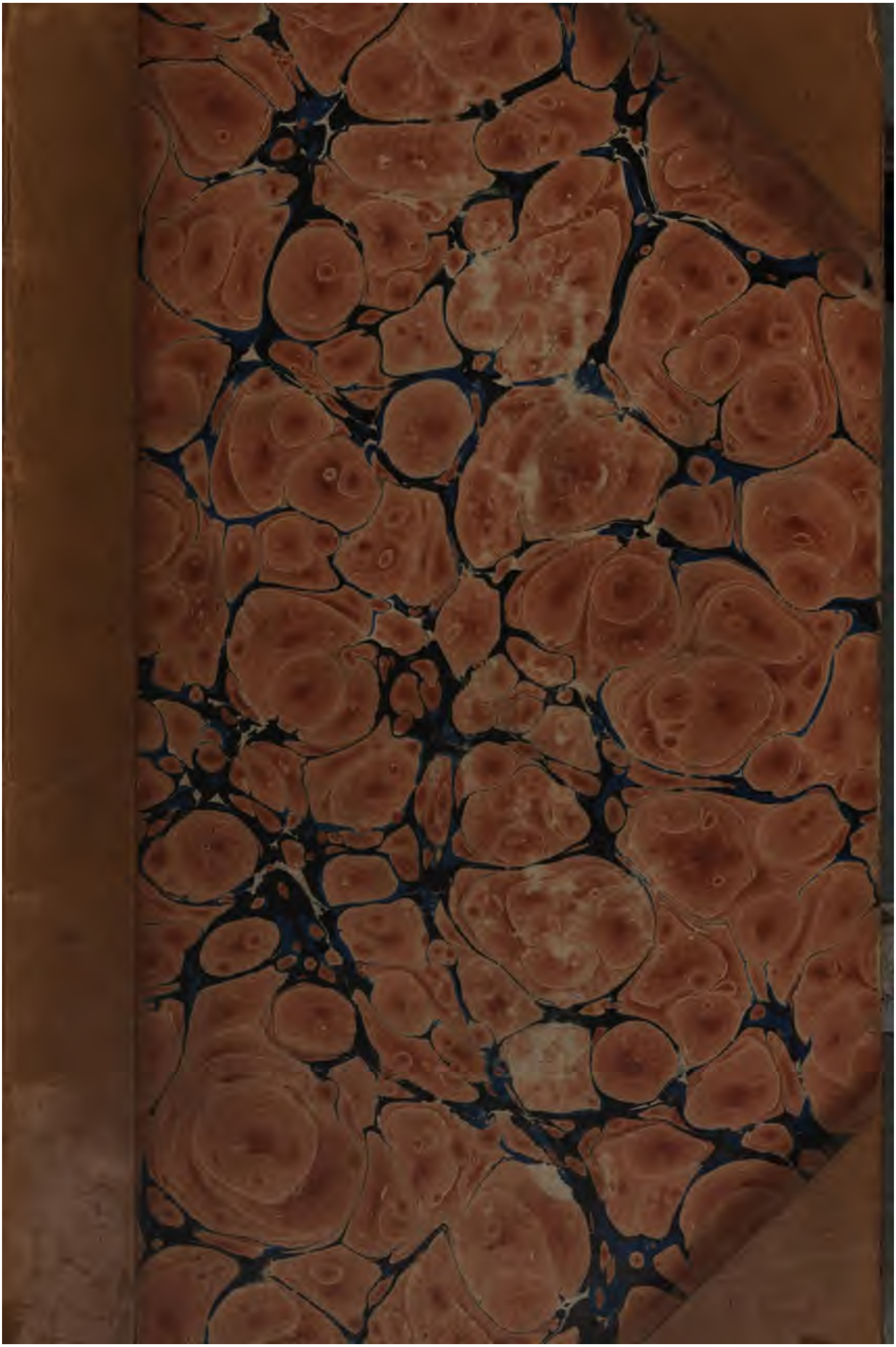

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THE

EDINBURGH
MEDICAL AND SURGICAL
JOURNAL:

EXHIBITING

A CONCISE VIEW

OF THE

LATEST AND MOST IMPORTANT DISCOVERIES

IN

MEDICINE, SURGERY, AND
PHARMACY.

VOLUME SEVENTY-SIXTH.

1851.

EDINBURGH:
ADAM AND CHARLES BLACK;
LONGMAN, BROWN, GREEN, & LONGMANS, LONDON;
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2. Report on the Employment of the Mineral Waters of Vichy in the treatment of Gout. Read to the Royal Academy of Medicine on the 24th March 1850, in the name of a Commission, by **M. Patissier**. Followed by an Answer to some Alegations against the Solution of Urinary Calculi, by **Charles Petit**, D.M., &c.

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Communications have been received from Dr **Kinnis**, Dr **Ritchie**, Dr P. C., Mr **Braid**, and Mr J. **Hyslop**.

The following publications have been received :—

Urinary Deposits, their Diagnosis, Pathology, and their Apertic Indications. By Golding Bird, A.M., M.D., F.R.S., F.L.S., Fellow of the Royal College of Physicians; Late President of the Westminster Medical Society, &c., Assistant Physician to, and Lecturer on Materia-Medica, and Therapeutics, at Guy's Hospital. Third Edition, Revised and Enlarged. London 1851. Post 8vo. Pp. 428.

A Practical Treatise on Diseases of the Urinary and Generative Organs (in both Sexes). Part I., Non-Specific Diseases; Part II., Syphelis. By William Acton, Late Surgeon to the Islington Dispensary, and formerly Externe at the Female Venereal Hospital, Paris. Second Edition. London, 1851. 8vo. Pp. 693.

Phthisis and the Stethoscope. A Concise Practical Guide to the Physical Diagnosis of Consumption. By Richard Payne Cotton, M.D., Member of the R. College of Physicians, London, Assistant Physician to the Hospital for Consumption and Diseases of the Chest. London, 1851. Foolscap ,8vo. Pp. 97.

On the Threatenings of Apoplexy and Paralysis; Inorganic Epilepsy; Spinal Syncope; Sudden Seizures; the Resultant Maxim, &c. By Marshall Hall, M.D., F.R.S., L. and E. Fellow of the Royal College of Physicians; Foreign Associate of the National Academy of Medicine of France, &c., &c., &c. London, 1851. 8vo. Pp. 90.

The Process of Thought, adapted to Words and Language. With a description of the Relational and Differential Machines. By Alfred Smee, F.R.S., Union Surgeon to the Royal General Dispensary, Aldersgate Street, Surgeon to the Bank of England, &c. London, 1851. 8vo. Pp. 77.

Nice et son Climat Avec des Notices sur le Littoral de la Mediterranée de Marseille a Genes. Par Edwin Lee, Membre du College Royal des Chirurgiens a Londres, &c., Paris. Ladres, Nice, 1851. 12mo. Pp. 132.

An Inaugural Essay or Zoo-Adynamia, presented for the Degree of Doctor of Medicine in the University of Pennsylvania. By George J. Ziegler, M.D. Philadelphia, 1850. 8vo. Pp. 64.

Reduction of Strangulated Hernia in Man. By George C. Blackman, M.D., Fellow of the Royal Medical and Chirurgical Society of London. New York, 1851. 8vo. Pp. 62.

A Practical Analysis of Seventy Cases of Inflammatory, Functional, and Structural Disease of the Heart; with Observations on the Treatment and Preventions. By S. Scott Alison, M.D., Licentiate of the R. Coll. of Physicians. London, 1851. 8vo. Pp. 45.

An Apology for the Microscope. Introductory Lecture to the First Course of Microscopic Anatomy and Pathology, delivered in the Theatre of the Original School of Medicine, during February, March, April, 1851. By Robert Lyons, M.B., T.C.D.L.R.C.J.J., &c. &c. Dublin, 1851. 8vo. Pp. 45.

On the Prevention and Cure of Spinal Curvatures and Deformities of the Chest and Limbs. Being the Result of Many Years Experience. By Mrs Godfrey, Henshaw Street, Liverpool. London, 1851. 8vo. Pp. 90.

Practical Remarks on some Exhausting Diseases. By Sir James Eyre, M.D., Licentiate of the R. College of Physicians; Senior Physician to the St George's and St James's Dispensary. Second Edition. London, 1851. Part 8vo. Pp. 110.

Outlines of Physiology, Anatomy, and Surgery. By William Wilkinson, Surgeon, Private Lecturer on Medicine. Edinburgh, 1851. 12mo, Pp. 412.

Pharmacopœia Collegii Regalis Medicorum. Londonensis, Londini, M.D.CCC.LI. 8vo. Pp. 196.

The Prescribers Pharmacopœia, containing all the Medicines in the New London Pharmacopœia of 1851, arranged in classes according to their action, with their Composition and Doses. By a Practising Physician. Fourth Edition. London, 1851. 32mo. Pp. 132,

A Translation of the New London Pharmacopœia; including also the New Dublin and Edinburgh Pharmacopœias, with a Full Account of the Chemical and Medicinal Properties of their Contents; forming a Complete Materia Medica. By J. Birkbeck Nevins, M.D., Lond., M.R.C.S., and L.A.C.; Medical Officer to the West Derby Union Hospital; Lecturer on Chemistry in the Collegiate Institution, and on Botany in the Medical School, Liverpool, &c. London, 1851. Post 8vo. Pp. 780.

On Diseases of the Mucous Membrane of the Throat and their Treatment by Topical Medication. By William R. Waggstaff, M.A., M.D., Fellow of the Medical Society of London; Member of the London Pathological Society, &c. London, 1851. Post 8vo. Pp. 183.

The Mesmeric Mania of 1851; with a Physiological Explanation of the Phenomena produced. A Lecture by John Hughes Bennett, M.D., F.R.S.E., Professor of the Theory of Physic and of Clinical Medicine in the University of Edinburgh. Edinburgh, 1851. 8vo. Pp. 21.

A Compendium of Materia Medica and Pharmacy, adapted to the London Pharmacopœia, embodying the New French, American, and Indian Medicines; and comprising a Summary of Practical Toxicology, with the Abbreviations used in Prescriptions. By J. Hunter Lane, M.D., F.L.S., F.S.S.A., &c., &c., &c. Second Edition. London, 1851. 12mo. Pp. 310.

The Wisdom and Beneficence of the Almighty as displayed in the Sense of Vision. (The Actonian Prize Treatise for 1851.) By Wharton Jones, F.R.S., Ophthalmic Surgeon to University College Hospital. London, 1851. 12mo. Pp. 135.

The Laws of Health in Relation to Mind and Body: a Series of Letters from an Old Practitioner to a Patient. By Lionel John Beale, M.R.C.I. London, 1851. Post 8vo. Pp. 306.

Lectures on the German Mineral Waters, and on their Rational Employment for the Cure of Certain Chronic Diseases. By Sigismund Sutro, M.D., Senior Physician to the German Hospital, &c. London, 1851. 12mo. Pp. 431.

The London Medical Gazette, or Journal of Practical Medicine. No. 1216, New Series 308, March 21, 1851,—to No. 1229, New Series 321, June 20, 1851.

The London Journal of Medicine. No. 28, April,—No. 29, May,—No. 30, June 1851.

The American Journal of the Medical Sciences. No. 42, New Series, April 1851. Philadelphia.

Weekly Tables of Mortality for the Metropolis. No. 12, week ending Saturday, 22d March 1851,—to No. 24, week ending Saturday, June 14th, 1851.

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3. A Compendium of Materia Medica and Pharmacy, adapted to the London Pharmacopœia, embodying the New French, American, and Indian Medicines, and also comprising a Summary of Practical Toxicology, with the Abbreviations used in Prescriptions. By J. HUNTER LANE, M. D.

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5. The New London Pharmacopœia. Translated and Arranged in a Tabular form, with the Edinburgh and Dublin Pharmacopœias; showing at one view the Differences in the FORMULÆ of the Three Colleges, together with the Tests given by each College for the Purity of the several Preparations; with Practical Remarks. By PETER SQUIRE, M. R. I. . . . 401

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On the Reciprocal Agencies of Mind and Matter, and on Insanity. Being the Lumleian Lectures, delivered at the Royal College of Physicians, A.D. 1851. By J. C. Badeley, M.D. Cantab., Fellow of the Royal College of Physicians, Inspecting Physician to the Lunatic Asylums of Essex, &c. London, 1851. Large 8vo, pp. 60.

The First Step in Chemistry. By Robert Galloway, F.C.S., Lecturer on Chemistry, Putney College, formerly Chemical Assistant in the Museum of Practical Geology. London, 1851. Post 8vo, pp. 91.

On the Infectious Origin and Propagation of Cholera. By Alexander Bryson, M.D., Surgeon, R.N. London, 1851. Post 8vo, pp. 47.

On the Local Origin of the Yellow Fever Epidemic of British Guiana; in a letter from Daniel Blair, M.D. Surgeon-General, British Guiana, to John Davy, M.D., F.R.S., &c. With Appended Documents. 8vo, pp. 162—197, *i.e.* 39.

A Practical Treatise on the Management of Diseases of the Heart and of Aortic Aneurism, with especial reference to the Treatment of those Diseases in India. By Norman Chevers, M.D., Civil Assistant-Surgeon, Chittagong, Bengal, and Calcutta. 1851. 8vo, pp. 145.

Collection of Facts illustrative of the Morbid Conditions of the Pulmonary Artery. By Norman Chevers, M.D., Civil Assistant Surgeon, Chittagong, Bengal, &c. (Published in the Medical Gazette between July 1846 and September 1851.) London, 1851. 8vo. Pp. 137.

The Anatomy and Diseases of the Prostate Gland. By John Adams, Fellow of the Royal College of Surgeons of England; Surgeon to the London Hospital and Lecturer on Anatomy, &c. London, 1851. 8vo. Pp. 160.

The Present Tendency of Investigation in Medicine. An Address delivered before the Suffolk District Medical Society at its Second Anniversary Meeting, Boston, March 28th 1851. By Samuel Parkman, M.D., M.M.S.S., one of the Surgeons of the Massachusetts General Hospital. Published by Request of the Society. Boston, 1851. 8vo. Pp.40.

Progress of Medicine during the first half of the Nineteenth Century. Being an introductory Lecture to the Spring Session in the Philadelphia College of Medicine. Delivered March 17, 1851. By James Bryan, M.D., Professor of Institutes and Medical Jurisprudence. Published by the College. Philadelphia, 1851. 8vo. Pp. 28.

Report of the Proceedings of the Sanatory Committee of the Board of Health, in relation to the Cholera, as it prevailed in New York in 1849. New York, 1849. 8vo, pp. 106.

A History of Epidemic Pestilences from the Earliest Ages, 1495 years before the Birth of our Saviour to 1848. With Researches into their Nature, Causes, and Prophylaxis. By Edward Bascome, M.D. London, 1851. 8vo, pp. 250.

The Prevention and Cure of Many Chronic Diseases by Movements. An exposition of the Principles and Practice of these Movements for the Correction of the Tendencies to Disease in Infancy, Childhood, and Youth, and for the Cure of many Morbid Affections of Adults. By M. Roth, M.D. London, 1851. 8vo, pp. 302. Illustrated by many woodcut figures.

Letter to R. K. Greville, LL.D. Being an Answer to Certain Statements contained in a Pamphlet entitled " Singular Specimens of the Edinburgh Practice of Criticism. By John Joseph Griffin." By John Hutton Balfour, M.D., Professor of Medicine and Botany in the University of Edinburgh. Edinburgh, 1851. Pp. 25.

Homœopathy; Report of the Speeches on Irregular Practice, Delivered at the Nineteenth Anniversary Meeting of the Provincial Medical and Surgical Association. Held at Brighton, August 13 and 14, 1851. London, 1851. 8vo. Pp. 32.

Quarterly Summary of the Transactions of the College of Physicians of Philadelphia, from November 5, 1850, to January 6, 1851, inclusive. Philadelphia, 1851. Pp. 55.

Observations on the Site and Construction of Hospitals. By Sir George Ballingall, M.D., F.R.S.E., Surgeon to the Queen, and to H. R. H. The Duchess of Kent; Regius Professor of Military Surgery in the University of Edinburgh; and Consulting Surgeon to the Royal Infirmary. Edinburgh, 1851. 4to. pp. 19.

Electro-Biological Phenomena considered Physiologically and Psychologically. By James Braid, M.R.C.S.E., M.W.S., &c. Edinburgh, 1851. 8vo. pp. 33.

The London Medical Gazette, or Journal of Practical Medicine. No. 1230, New Series 322, June 27, 1851 to 1241, No. New Series, No. 333. September 12, 1851.

The British and Foreign Medico-Chirurgical Review, or Quarterly Journal of Practical Medicine and Surgery. No xv. July 1851. London. 8vo.

The Journal of Physchological Medicine and Mental Pathology. Edited by Forbes Winslow, M.D. No xv. July 1851. London.

The London Journal of Medicine. No. 31, July. No 32, August. No 33, September, 1851.

The American Journal of the Medical Sciences. No 43. New Series. July 1851. Philadelphia.

Weekly Tables of Mortality for the Metropolis. No 25, Week ending Saturday, June 21, 1851, to No 37, Week ending Saturday, September 13th.

The Dublin Quarterly Journal of Medical Science. No XXIII., August 1851. Dublin.

The Retrospect of Medicine: being a Half-yearly Journal, containing a Retrospective View of every Discovery and Practical Improvement in the Medical Sciences. Edited by W. Braithwaite, Lecturer on Obstetric Medicine at the Leeds School of Medicine, &c. Vol. xiii., January—June 1851.

The Half-Yearly Abstract of the Medical Sciences. Being a Practical and Analytical Digest of the Contents of the Principal British and Continental Medical Works published in the preceding six months. Edited by W. H. Ranking, M.D., Cantab. Physician to the Norfolk and Norwich Hospital. Volume xiii. January—June 1851.

⁂ Communications and Books to be sent free to Messrs LONGMAN & Co., London; or to Mr INCHES, Printer, Old Assembly Close, Edinburgh.

THE

EDINBURGH

MEDICAL AND SURGICAL JOURNAL.

1st JULY 1851.

PART I.

ORIGINAL COMMUNICATIONS.

Art. I.—*Contributions to the Military Medical Statistics of the Bombay Presidency.* By John Kinnis, M.D., Deputy Inspector-General of Her Majesty's Hospitals.

Part II.—*On the Health of the Queen's Troops serving in the Presidency of Bombay, from 1st April* 1847 *to 31st March* 1848.

Of the twelve months embraced by this contribution, I spent only five in the Bombay Presidency; and as my opportunities of personal observation and inquiry when it was written, had not extended beyond Bombay proper, Poona, and Kirkee, it is little more than an analysis of the annual sick returns.

Stations and Movements.—The 10th Hussars have kept their station at Kirkee, the right wing of the 8th (King's), and the 22d Foot at Poona, the 78th Highlanders at Belgaum, and the 1st battalion 60th Rifle Regiment at Kurrachee in Scinde, the whole year. From April to October inclusive, the 86th Regiment was divided betwixt Poona and Colaba. Early in November the right wing left Poona; and early in December the left wing Colaba for Deesa, to relieve the 28th Regiment, which simultaneously moved towards Bombay, and embarked for England in January, being previously reduced in strength, by the discharge of volunteers for other corps, from 1125 to 660 men.

General Health of the Queen's Troops in comparison with former years.—During the year ending 31st March 1848 of the Queen's troops, the

Average strength has been, ...	6604
Average daily sick, ...	522
Or 79 per thousand.	
Total number admitted, ...	11538
Or 1747 per thousand.	
The deaths in hospital, ...	145
Or 22 per thousand of the strength, and 12⅓ per thousand of the admissions.	
The number invalided, ...	160
Or 24⅕ per thousand of the strength.	

With exception of 1832, in which 74 men only died, from an average force of 3670, that is 20⅒ per thousand, no year embraced by the records of my office has been so propitious to the health and life of Queen's troops, serving in this Presidency, as the last. Since the 21st December 1825, the date at which these records commence, the average annual strength has been 4427.

Average daily sick, ...	386, or	87	per 1000 of the strength.
Average annual admissions,...	9180, or	2073	
Average annual deaths, ...	283, or	64	

and 30·8 per 1000 of the admissions.
Average annual number invalided, 135, or 30½ per 1000 of the strength.

In four out of these twenty-two years the mortality exceeded one-tenth of the strength, being

In 1825,	305	from	2973,	or	102·6	per 1000.
„ 1839–40,	343	„	3413,	„	100·5	„ „
„ 1842–43,	733	„	6858,	„	106·9	„ „
„ 1844–45,	797	„	6354,	„	109·7	„ „

In 1846–47, the mortality was not quite so high as in any of the four years referred to, being 659 from an average strength of 6740, or 97·8 per 1000.

Comparative Health of Different Corps.—The comparative sickliness and mortality of different regiments during the past year are shown in this table :—

	10th Hussars.	8th.	22d.	28th.	60th.	78th.	86th.	Tot.*
Average annual strength,	649	1019	958	1021	951	1112	893	6604
Remained sick 1st Ap. 1847,	52	124	72	56	45	138	52	539
Average daily sick, ...	63	106	78	61	45	113	56	522
Being per 1000 of the strength, ...	97	104	81	60	47	102	63	79
Sick admitted, ...	1532	2121	1935	1247	1136	1984	1583	11538
Being per 1000 of the strength, ...	2361	2081	2020	1221	1194	1784	1772	1747
Deaths, ...	17	13	23	17	23	13	39	145
Being per 1000 of the strength, ...	25·4	12·7	24	16·7	24·2	11·7	43·7	22
„ „ of the admissions,.....	11·1	6·1	11·9	13·6	20	6·6	24·6	12·5
Discharged, ...	1502	2150	1841	1273	1066	1988	1528	1148
Invalided,.........	16	13	42	13	27	34	16	161
Being per 1000 of the strength, ...	25	13	44	13	28	31	18	24
Remaining sick 31st March 1848,.....	49	69	101	...	65	87	52	423

It hence appears that in different corps the average daily sick

varied from . .	47 to 104	per 1000 of the strength.
Total annual admissions,	1194 „ 2361	
Total deaths, .	11·7 „ 43·7	
Number invalided, .	13 „ 44	

And that in order of Sickliness.			In order of mortality.	
The 10th Hussars are	1st.	...	86th Regiment,	1st.
„ 8th Foot, .	2d.	...	10th Hussars, .	2d.
„ 22d „ .	3d.	...	60th Rifles, .	3d.
„ 78th „ .	4th.	...	22d Foot, .	4th.
„ 86th „ .	5th.	...	28th „ . .	5th.
„ 28th „ .	6th.	...	8th „ . .	6th.
„ 60th „ .	7th.	...	78th „ . .	7th.

In addition to 145 deaths in hospital 12 casualties occurred, 5 by drowning, 2 by suicide, 1 by ruptured blood-vessel, 2 by apoplexy; and of 2 men found dead the cause was unknown.

---

* The total of these corps was 6603; in addition there was one man of the 17th Regiment of foot at the Queen's Depôt, Colaba.

The following table has been constructed for the more precise calculation of the

Comparative Salubrity of dffierent Stations.

Divisions.	Stations.	Period.	Corps.	Average strength for the period.	Average annual strength.	Admissions.	Rates per 1000 of admissions to annual strength.	Deaths.	Rates per 1000 of deaths to annual strength.
Presidency,	Colaba,	17th Jan. to 31st Mar.,...	8th, lft. wing,	478	97	148	1526	1	10
		1st Dec. to 8th Feb., ...	28th Regim.	647	129	187	1449	3	23
		1st April to 2d Dec., ...	86th, lft. wing	407	274	547	1996	23	84
			Total,	...	500	882	1764	27	54
Poona,	Kirkee,...	Whole year,	10th Hussars	...	644	1508	2342	16	25
	Poona,...	„	8th Foot, ...	...	919	1963	2136	11	12
		„	22d „	...	945	1889	1999	22	23·3
		1st April to 7th Novem.,	86th, rt. wing	...	227	417	1837	3	13·2
			Total—Poona,		2091	4269	2041	36	17·2
			Total—Poona division,		2735	5777	2112	52	19
Southern,...	Belgaum,...	Whole year,	78th Regim.	...	1101	1949	1770	13	11·8
Northern,....	Deesa, ..	17th Ap. to 30th Nov.,...	28th „	1125	882	1032	1170	13	14·8
		17th Dec. to 31st March,	86th „	709	261	436	1670	11	42
			Total,		1143	1468	1284	24	20·9
Scinde,......	Kurrachee,	Whole year,	60th, 1st Batt.	...	936	1119	1109	22	23·5
En route from Poona and Bombay to Deesa.		8th Nov. to 1st Dec. and 3d Decem.,	86th Regim.,	1125	103	154	1495	1	·97
Qeen's Depot and invalids, ...					86	189	2198	6	69
			Total in the command,		6604	11538	1747	145	22

By this table it appears that of every thousand men serving in

	Were admitted	Died.
The Command, ...	1747 ...	22
Presidency Division or Colaba,...	1764 ...	54
8th Regiment, ...	1526 ...	10
28th „	1449 ...	23
86th „	1996 ...	84
Poona division, ...	2112 ...	19
Kirkee, 10th Hussars, ...	2342 ...	25

	Admitted.	Died.
Poona station,	2041	17·2
8th Regiment,	2136	12
22d „	1999	23·3
86th „	1837	13·2
Southern division, Belgaum, 78th Regiment,	1770	11·8
Northern division, Deesa,	1284	20·9
28th Regiment,	1170	14·8
86th „	1670	42
86th, En route to Deesa,	1495	9·7
Scinde, Kurrachee, 60th ditto,	1195	23·5

The most remarkable results of these comparisons are that the left wing of the 86th Regiment lost at Colaba six and a half times as many men, in proportion to the strength, as its own right wing at Poona, or the 78th Highlanders at Belgaum; while the 8th and 86th together at Poona lost little more than one-half the proportion lost by the 22d at the same station, or by the 10th Hussars at Kirkee.

Colaba and Poona, on the Health of H. M. 86*th Regiment.*—Having called for separate monthly returns of the two wings of Her Majesty's 86th Regiment, from 1st April to 31st December 1847, I received with them from Dr Thom, surgeon of the regiment, the following observations.

"The accompanying returns present a very clear proof of the effects of the climate of Bombay and Poona on European soldiers, after having been debilitated by three years' service in Scinde, the longest period that any corps has yet remained in that unhealthy and treacherous region.

"The constitutions of the men of both wings were nearly alike; both had been subject to the long march of one thousand miles to Bahawulpore, and tried, by a residence in tents, on an arid and scorching plain, near Kurrachee, during the hottest months of the year; and all more or less undermined by the deleterious effects of the atmosphere, which spread a deadly pestilence, in the form of cholera, over the cantonments, and in a few days carried off about 240 of the regiment, leaving nearly 200 convalescents in the ranks, who, although escaping from the direct effects of the appalling malady, yet had been so seriously shattered, as to leave them prone to an attack of other diseases, especially those that prevail at Bombay.

"The regiment had scarcely recovered from the terrible visitation of cholera in June and July 1836, when it was ordered down from Kurrachee, and the largest body left to do duty in Bombay, where it remained from February to December 1847.

"The great disproportion between the admissions and deaths in the wings at Poona and Bombay, cannot in any way be accounted for, except by the effects of the climate and duties of the latter on weakly men. If there can be any difference traced between the state of the health of the two bodies, on their leaving Scinde, it was decidedly in favour of that left in Bombay, in as much as it consisted of the centre companies, which suffered least from cholera. The grenadiers and light company lost nearly twice as many men from cholera as those of the centre companies, and were subsequently much more sickly, but were sent to Poona.

" It is equally remarkable, that last year both Poona and Bombay were unusually healthy, and free from those epidemics that occasionally visit that part of India with fatal sweeps, and, in particular, render the latter place so injurious to the health of European soldiers. It is said that the opportunities for drinking are more numerous at Bombay than Poona. This I question very much, as the open cantonment of the latter is much more surrounded by places where intoxicating liquors can be procured than the island of Colaba, communicating with the fort of Bombay by a narrow causeway. The duties of Bombay are no doubt very severe, and must have told seriously on the broken constitutions of our men just arrived from Scinde. This would appear to be confirmed by the fact of the principal mortality in the wing arising from organic disease, only four out of twenty-five having died from fever, while more than two-thirds of the fatal cases occurred from affections of the abdominal viscera,—a class of ailments alike numerous and formidable in Scinde, which had chiefly prevailed in the regiment for the previous twelve months.

" The following abstract affords a parallel and comprehensive view of the more important groups of diseases, and their proportional mortality in the two wings of the regiment at Poona and Bombay.

STATION.	WING AT BOMBAY.				WING AT POONA.			
Strength.	450.				401.			
Diseases.	Admitted and Treated.	Died.	Ratio of Admission to Strength per 1000.	Ratio of Death to Admissions per 1000.	Admitted and Treated.	Died.	Ratio of Admission to Strength per 1000.	Ratio of Death to Admissions per 1000.
Febrile Diseases,	286	4	635	14	101	...	250	...
Head do.....	11	3	24	272	1	...	2	...
Thoracic do.....	26	1	57	38	32	1	79	31
Abdominal do...	135	17	300	126	120	2	299	16
Other do...	247	...	548	...	218	...	543	...
Total,.....	705	25	1166	35	472	3	1179	9

"The preceding abstract does not exactly show the full extent of the disparity between the diseases and deaths of the two wings; for of three deaths at Poona, one was that of a sergeant sent up from Bombay, in the last stage of hepatic disease, with three large abscesses in the liver, and who died within a fortnight after his arrival at Poona. Properly speaking, this ought to be deducted from the Poona return, and added to the column of deaths, which are attributable to Bombay. Besides these, two men, belonging to the wing, that was at Bombay, died of hepatic and pulmonic diseases within three or four days after their junction with the other half of the regiment at Deesa; and these two cases ought virtually to be included under the head of deaths caused by maladies contracted at Bombay; but as those causualties did not actually happen before the junction of the two wings, they have not been entered in the accompanying returns.

"The cases would stand thus,—28 deaths at Bombay in 450, and 2 at Poona in 401, or in the ratio of 62 per 1000 at the former, and 5 per 1000 at the latter. This is, indeed, a very striking, almost fearful disproportion between the effects at Bombay and Poona; but I have no hesitation in saying that the fatality which occurred at Bombay was very much to be attributed to the previous effects of residence in Scinde, leaving the seeds of disease, in a latent state, ready to be called into dangerous activity by the climate of Colaba, or, on the other hand, to be eradicated by the fine bracing air of Poona. Had another body of men, from a more salubrious locality than Scinde, been in Bombay during the last unusually healthy year, the probability is, that, instead of losing upwards of six per cent. in nine months, they would have lost only three or four.

"It is remarkable that the number of admissions in the two wings is by no means so unequal as might be expected, and the difference chiefly consists in 185 cases of fever more at Bombay than at Poona; yet, from this class of ailments, the mortality is trifling, indeed extraordinarily so, considering the climate.

"It is to ailments of the abdominal viscera that the principal mortality is traceable, and of the whole 28 deaths occurring in the wing at Bombay, 19 are referable to those diseases. Now, it is a singular fact, that the rates of admissions from these are exactly alike in both wings, being 300 per thousand at Bombay, and 299 at Poona. Here, however, the comparison ends; for, in the rates of *death to admissions*, it is 126 per thousand at the one, and only 16 per thousand at the other, even as the table stands; and, as I have explained, that one of the hepatic cases at Poona belongs to Bombay; another, since dead, is to be added; it leaves the true state to be 140 per thousand at Bombay, and 8 per thousand at Poona. It is chiefly on this circumstance that I found my opinion, that both wings of the regiment were highly predisposed to affections of the abdominal viscera, from their services and sufferings in Scinde; but that, although numerically alike in both bodies, they acquired at Bombay an intensity that led to the fatal results before us. The detail of these diseases is as follows.

Abdominal Diseases.	At Bombay. Admitted.	At Bombay. Died.	At Poona. Admitted.	At Poona. Died.
Peritonitis and gastritis,	4	...	...	...
Hepatitis acuta et chronica,	21	5	21	2
Diarrhœa,	...	...	55	...
Dysenteria acuta et chronica,	36	8	12	...
Cholera,	7	2	2	...
Colica,	23	...	9	...
Dyspepsia,	42	2	21	...
Hæmorrhois,	2	...	...	...
Total,	135	17	120	2
By preceding explanation ought to be	...	19	...	1

"The numbers of bowel complaints are nearly the same in the aggregate; but, instead of 36 attacks in the form of acute dysentery at Bombay, only 12 occurred at Poona, while 55 cases of diarrhœa took place at the latter. Strange to say not a single case is recorded as having been admitted at the former; but, in lieu thereof, 23admissions of colica, and an increase of dyspeptic cases, restore the numerical balance."

Comparative prevalence and fatality of different classes of diseases.—Of 11,538 admissions in the whole command were returned under

			Per 1000 of the whole admissions.	Died.	Per 1000 of the whole deaths.
Fevers,		3066	*i. e.* 263	30	207
Eruptive fevers,		12	1	...	...
Diseases of the	Lungs,	541	47	19	131
	Liver,	463	40	26	179
	Stomach and bowels,	1880	163	49	338
	Brain,	92	7·1	11	76
Dropsies,		7	6	1	7
Rheumatisms,		780	68	...	...
Venereal diseases,		2360	204	2	13·2
Ulcers and abscesses,		745	65	...	...
Wounds and injuries,		598	52	1	7
Punishment,		3	26	...	...
Morbi oculorum,		354	30·7	...	...
Morbi cutis,		53	4·5	...	...
Other diseases,		584	56	6	41
Total,		11538	...	145	..

Of the fevers, 1543 were admitted and 3 died under intermittent.
195 ... 14 ... remittent.
1328 ... 13 ... continued.
Total, 3066 30

Prevalence and fatality of fever at different stations.—Of the 30 fatal cases from this class of diseases,

				Being per 1000 of	
	Admissions.	Annual average strength.		Admissions to annual strength.	Deaths to admissions.
5 occurred in	380	from 586	at Colaba,	648	13
4 ...	260	... 644	,, Kirkee,	404	15
9 ...	1517	... 2091	,, Poona,	724	6
1 ...	173	... 1101	,, Belgaum,	157	6
8 ...	496	... 1246	,, Deesa,	391	18
3 ...	240	... 936	,, Kurrachee,	256	12½
30	3066	6604		464	9·78

By this calculation it appears that among every thousand men throughout the command, 464 cases of fever occurred during the year; and that of every thousand cases of fever, 9·78 died, while at different stations the proportion attacked varied from 157 to 724 per thousand of the strength, and the deaths from 6 to 16 per thousand of the admissions; that fevers were least fatal at Poona and Belgaum, and at Belgaum least prevalent also; but at Poona more prevalent than at any other station.

Fever in Her Majesty's 22d Regiment.—1044 cases occurred in the 22d Regiment at Poona, being nearly one-third of the whole, and in the proportion of 1184 per thousand of the strength of the corps, while only 5 or 4·79 per thousand of the number attacked died. During a portion of the preceding year, the 22d Regiment had suffered severely from fever at Colaba and Bombay, the total number of cases treated having been 2549. A large proportion of the men who continue to suffer from periodical fever have enlarged livers or spleens, and are subject to relapses from slight causes. Of the five fatal cases, however, two were in recruits, 18 or 19 years old, who had been respectively 6 weeks and 4 months only in the command. The subjects of the other three were from 23 to 24 years old, and had served here betwixt 18 months and 4 years. In one of them the liver, spleen, and mesenteric glands were found enlarged; one lobe of the left lung hepatized, and the cæcum the seat of a few ulcerated spots. Another had been previously in hospital on account of fever and bowel complaint, and was re-admitted six days after his discharge, with low typhoid symptoms, which carried him off in four days more.

Remittent Fever in Her Majesty's 8th Regiment.—Of three fatal cases returned under remittent fever in the 8th Regiment, two were admitted on the 10th, and the third on the 12th February, all from the same barrack-room; and this room exposed to the emanations from a neighbouring latrine, to which Dr Tice attributes the fatal attack. Only one other fatal case of fever occurred in that corps at Poona, and one at Colaba, making five in all.

Of the remaining fatal cases of fever at Colaba, four in number, one occurred in the 28th, and three in the 86th Regiment.

Of eight fatal cases of fever referred to Deesa, six belonged to the 28th and two to the 86th Regiment; but two of the former and one of the latter occurred en route to and from Bombay.

Eruptive Fevers.—Under eruptive fevers have been included two cases of small-pox, one in the 8th Regiment at Poona, and another in the 60th Rifles at Kurrachee; both of which terminated favourably, though a married woman of the 8th Regiment, in whom it assumed a confluent form, fell a victim to the disease. This woman had been vaccinated, and retained the mark on her arm. Dr Tice has since vaccinated a great number of his men, and nine cases returned under vaccinia were the first taken into hospital for that purpose. A single case of varicella appears in the 86th return, and occurred in the right wing at Poona.

Stomach and Bowel Complaints.—To diseases of the stomach and bowels are referable 1880 admissions and 49 deaths. Of these cases

					From an average strength.	Being per 1000	
						Of admissions to strength.	Deaths to admissions.
233	occurred and	11	died at	Colaba,	586	398	47·2
354	...	4	...	Kirkee,	644	550	11·3
579	...	14	...	Poona,	2091	272	24·2
250	...	8	...	Belgaum,	1101	227	22·7
267	...	3	...	Deesa,	1246	214	11·2
197	...	9	...	Kurrachee,	936	210	45·7
1880		49 in the command,			6604	286	26

Bowel complaints, therefore, varied in prevalence at different stations, from 210 per thousand, or less than one-fourth of the strength in Scinde, to 550 per thousand, or above one-half of the strength at Kirkee. The proportion of fatal cases was highest at Colaba, being 47·2 per thousand of the admissions, and nearly as high, *i. e.* 45·7 at Kurrachee, while at Deesa it was so low as 11·2, and at Kirkee as 11·3 per thousand.

The specific diseases referred to this class are of

Peritonitis,	5	admissions	1	death.
Gastritis,	7	,,	...	,,
Enteritis,	5	,,	1	,,
Hæmatemesis,	3	,,	...	,,
Dysenteria acuta,	309	,,	29	,,
Dysenteria chronica,	94	,,	10	,,
Diarrhœa,	868	,,	5	,,
Cholera,	20	,,	2	,,
Dyspepsia,	271	,,	...	,,
Colica,	230	,,	...	,,
Obstipatio,	68	,,	1	,,
Total,	1880		49	

Internal Strangulation of Intestines causing Fatal Enteritis in Three Cases.—Three varieties or modes of internal strangulation, causing obstruction of the bowels, inflammation, and death, have been exemplified in different corps during the year.

A fatal case of peritonitis occurred at Poona in a man of the 86th Regiment, who had been for several years exceedingly subject to cholera, colic, and pain of the bowels. The symptoms were very acute, and, in spite of active treatment, the disease rapidly terminated in gangrene. On inspection after death the descending colon was found to be bound down, in an unnatural position, to the cæcum, by old adhesions betwixt them, and the omentum to present an almost insurmountable obstruction to the passage of flatus or fæces. The large intestines were greatly distended by gas, "which, in connection with the adhesions, had caused twistings and duplications that acted as complete obstructions, and the more insuperable had become the barriers to the escape of air. The result was, that the whole of the ascending, and a portion of the transverse colon, were found to be in a state of sphacelus."

Total obstruction of the intestines occurred, from intus-susception, in another case, which has been returned under *obstipatio*, by Dr Tice of the 8th Regiment. On opening the body, fœtid gas issued from the abdomen, the small intestines were much distended, the colon presented several sphacelated spots, and, on its lumbar aspect, a perforation was found, through which had been effused into the peritoneal cavity about two ounces of a brownish oily fluid, the materials of an enema injected the day before. Invagination of the ileum into the cæcum had taken place, terminating in a pyriform tumour the size of a hen's egg, so firmly bound down by adhesions as to be unsusceptible of reduction, and the passage through the strangulated part was altogether obliterated.

The third case occurred in a man of the 22d Regiment, 24 years of age, who was admitted for enteritis on the 14th, and died on the 16th May. The ileum was found highly inflamed and strangulated by a band of peritoneum.

Dysentery at Different Stations and in Different Corps.—Of 403 cases admitted for dysentery, acute and chronic, 39 or 92 per thousand died.

Of 22	admitted at	Kirkee the	10th Hussars	lost 4
" 37	"	Poona "	8th Foot	" 1
" 66	"	" "	22d "	" 10
" 11	"	" "	86th "	" ...
" 10	"	Colaba "	8th "	" ...
" 15	"	" "	28th "	" ...
" 36	"	" "	86th "	" 8
" 12	"	" "	Queen's Depôt	" 1
" 75	"	Belgaum "	78th Foot	" 5
" 54	"	Deesa "	28th "	" ...
" 19	"	" "	86th "	" 1
" 46	"	Kurrachee "	60th "	" 9
403		Total,	.	39

It hence appears that dysentery was most fatal in the 86th at Colaba, the 10th Hussars at Kirkee, and the 22d Foot at Poona. Yet, as Dr Currie of the 22d remarks, " the number of deaths in that corps from dysentery is very small this year compared with the preceding, which amounted to 45. In the end of 1846 and beginning of 1847 the regiment suffered very seriously from bowel complaints, consequent upon the fever, which prevailed so extensively at Colaba; and, probably, some of the casualties from dysentery, during the past year, may be ascribed to the same cause." Two of the fatal cases were complicated with hepatic abscess. One fatal case of diarrhœa, among 99 treated in the 22d Regiment, died also in consequence of hepatic abscess.

Diarrhœa.—Eight hundred and sixty-eight cases and five deaths are returned under diarrhœa. Three of the deaths occurred in the 78th Highlanders at Belgaum out of 83 admitted; one in the 86th at Colaba out of 47; and one, as just remarked, combined with hepatic abscess, out of 66 in the 22d. In some of the cases in the 86th Regiment the disease approached the form of mild cholera, being attended by abdominal spasms, vomiting, as well as purging, and by dejections of a whitish milky colour. In all, exhibiting this last sign, calomel and opium were given, with the effect of at once arresting the bad symptoms, and bringing on a mild reactive stage. The fatal case referred to this head in the 86th occurred in a recruit, who arrived at Deesa from

Bombay in a moribund state, from continued looseness, with swelled abdomen, anasarca, constant cough, and partial palsy of side; hectic fever and diarrhœa soon carried him off. On inspection after death, the heart was thin and soft, the lungs slightly œdematous. There was some effusion into the right cavity of the chest and abdomen, and numerous ulcers along the whole course of the small and large intestines.

Colica in 10th Hussars.—Mr Ross observes, that many of the cases returned under colic in the 10th Hussars might have been referred to bilious cholera, but that he avoided the name as tending to create alarm. These were generally subdued by a dose of mercurial pill and opium, followed by an aperient of jalap, rhubarb, magnesia, and ginger.

Cholera.—Of the twenty cases returned under *cholera morbus* and *cholera spasmodica*, seven occurred in the 86th wing at Colaba, and comprised only two fatal cases; three occurred in the same corps at other stations; three in the 78th at Belgaum; and one in the Queen's Depot, Colaba; two in the 28th Regiment, two in the 22d; and one respectively in the 10th Hussars, and eighth wing at Poona.

Hepatic Diseases.—Under hepatic diseases are to be noticed 463 admissions, and twenty-six deaths, comprising 239 cases of acute, 168 of chronic hepatitis (thirteen of each proved fatal); and fifty-six of icterus.

All the fatal cases terminated in suppuration; several of the abscesses were opened by the trocar, and several had made for themselves passages through the diaphragm into the chest or lungs, but without apparent influence in arresting or retarding the fatal termination.

PART III.—*On the Health of the Queen's Troops, serving in the Presidency of Bombay, from 1st April* 1848 *to 31st March* 1849.

Rations and Diet.—The soldier's daily ration in this command consists of one pound of bread, one pound of beef or mutton, four ounces of rice, one and a-half ounce of sugar, and five-sevenths of an ounce of tea, for which the stoppage from his pay is two annas eleven pies. He is supplied in addition, by private contract, with a supper meal of a quarter of a pound of bread and half a pound of meat. The commissariat rations are generally good and wholesome, though at Deesa the meat, more particularly the beef, is lean, lank, and bony. The mutton cannot be called good, but is better than the beef, and supplied there four days in the week. As some compensation at that station, butter and milk happen to be plentiful and cheap. Here, and at Kurrachee, the supply of vegetables is scanty and inadequate in the dry season.

Duty and Employment.—The duties are generally light, excepting perhaps at Colaba, where the wing of a regiment, 500 strong, furnishes daily guards, amounting to 85 non-commissioned officers and men, of whom 41 have to march from Colaba to Bombay Fort and back. The additional duties at this station are two commanding officers' parades, and about five adjutants' drills a week. At Deesa, on the contrary, men are required to mount guard only once in ten days.

Internal Economy.—Every possible attention appears to be paid, throughout the command, to the comfort and welfare of the men, who are generally well conducted; yet intemperance is still greatly too prevalent among them. The ordinary punishments are instruction drill, heavy marching order drill, and confinement in the dry room, guard room, or solitary cells. There were eleven cases of corporal punishment during the year, three in the 22d, three in the 60th, four in the 78th, and one in the 86th; none either in the 10th Hussars or 8th Regiment; yet, in this last corps, no fewer than 25 cases of *delirium tremens* occurred, and eight only in all the other corps together; one in the 8th out of 33 cases in all terminated fatally. The canteens are supplied with good English draft porter, by the commissariat department, at cost price, and every inducement held out to the men to drink this liquor or beer in preference to spirits. Every soldier, unfortunately, is still allowed to drink if he choose three drams, equal to one-fourth of a bottle of spirits a day. By the judicious recommendation of Dr Thom, the men of the 86th Regiment, who indulge in the mid-day dram, have that allowance, diluted with two-thirds of water, served out to them in their barrack room, and thereby escape the danger of walking to the canteen under a burning sun. In every corps is a library of well selected books, to which the men subscribe from two to four annas a month; their out of door amusements being cricket, long balls, quoits, &c.

Average Strength, Changes of Station, and Comparative Health of Different Corps.—The command has enjoyed a happy immunity from epidemic or pestilential sickness, and the Queen's troops excellent health, during the two last, as compared with previous, years. In that ending 31st March 1848, the deaths in hospital were 145, from an average strength of 6604 non-commissioned officers and men, *i. e.* two and one-fifth per cent. This year, ending 31st March 1849, the deaths have been four more for every thousand men, that is 165 from an average strength of 6295, or two and six-tenths per cent; while during the 21 years, ending 31st March 1847, the average annual strength was 4326, and the average annual mortality 288, or 6·67 per cent.

The 10th Hussars were stationed at Kirkee, the 78th Highlanders at Belgaum, and the 86th Regiment at Deesa the whole year; the 22d Regiment and right wing of the 8th at Poona, the left wing of the 8th at Colaba, and the 60th at Kurrachee, the first six months. On the 29th September the left wing of the 8th embarked for Kurrachee, and was detached to Hydrabad on the 12th February. The left wing of the 22d marched from Poona for Colaba on the 2d October, embarked for Kurrachee on the 24th January, and the right wing proceeded from Poona to replace it at Colaba. The 60th Rifle Regiment marched from Kurrachee, on the 6th October, to the bank of the Indus, and embarked at Tatta five days later, encamped at Roree until the 26th November, and proceeded thence to Mooltan and Peshawur.

The comparative health of different regiments is here shown.

Of the	10th Hussars, Kirkee.	8th Regt. Poona, Colaba, Kurrachee, Hydrabad.	22d Regt. Poona, Colaba, Kurrachee.	60th Regt. Kurrachee, Pungaub.	78th Regt. Belgaum.	85th Regt. Deesa.	Total.
Average strength,	702	1050	1172	1059	1139	1173	6295
Average daily sick,	75	98	107	57	93	57	487
i. e. per 1000,	107	93	91	54	82	49	77
Sick 1st April 1848,	49	69	101	65	87	52	423
Admissions,	1612	2296	2269	1388	1697	1744	11006
i. e. per 1000,	2296	2187	1106	1216	1455	1401	1748
Deaths in hospital,	9	29	45	32	20	30	165
i. e. per 100 of the strength,	12·8	27·6	38	30	18	25	26
i. e. per 100 of the admissions,	5·64	14·12	21·1	23	11·7	17	15
Deaths out of hospital,	...	3	...	12	2	...	17
Invalids,	36	41	63	21	45	12	218
i. e. per 1000 of the strength,	51	38	54	19	39	10	34
Sick 31st March 1849,	76	97	106	58	84	63	484
In different corps, therefore, the average daily sick varied from	57	to	107				
Total annual admissions,	1336	to	2296	per 1000 of			
Total deaths,	12·8	to	48	the strength.			
Number invalided,	10·4	to	55				

And in order of

Sickliness	Mortality
The 10th Hussars was 1st,	The 22d Regiment was 1st,
„ 8th Regiment „ 2d,	„ 60th „ „ 2d,
„ 22d „ „ 3d,	„ 8th „ „ 3d,
„ 78th „ „ 4th,	„ 86th „ „ 4th,
„ 86th „ „ 5th,	„ 78th „ „ 5th,
„ 60th „ „ 6th.	„ 10th Hussars „ 6th.

10*th Hussars.*—The mortality of the 10th Hussars has been always small in proportion to its sick. It has been stationed at Kirkee since September 1846, the month after its arrival in the command. Betwixt August 1846 and September 1847, it lost thirteen men, three of them from cholera during, and on the conclusion of, its march from Panwell. It lost seventeen the second year, ending March 1848, and only nine last year; yet, while the admissions for the whole command are 175 per cent. of the strength, the admissions for the 10th Hussars are 224.

8th Regiment.—The Eighth Regiment, too, arrived in August 1846, and reached Poona on the 3d September. The left wing was sent to Colaba in February 1848, and to Kurrachee on the 29th September; the right wing being also moved to the same station from Poona after two years' service there. Exposed hitherto to no epidemic or pestilential sickness, though the left wing suffered, as all corps suffer at Colaba, the men of the 8th have sounder constitutions, and less predisposition to disease than any other Queen's troops in the command. From August 1846 to March 1847 this corps lost fifteen men; next year, ending March 1818, only thirteen; and last year twenty-nine, eight of them in the left wing at Colaba.

22d Regiment.—The 22d Regiment, on the other hand, during seven years' residence in this Presidency, has been much exposed to vicissitudes of climate and hard field service in Scinde and in the Deccan, bringing in their train frequent and formidable visitations of fever, bowel complaints, hepatitis, and *cholera morbus*, and entailing, on a large proportion of the men, impaired health, or predisposition to febrile and visceral disease.

60th Regiment.—The 60th Rifle Regiment was stationed at Poona, from its first arrival in October 1845 to 29th January 1846, and was then moved to Kurrachee. After two years and eight months' residence there, it went on service to Moultan and the Punjaub on the 6th October last, and remained quartered for the monsoon at Peshawur. From October 1845 to March 1846 the deaths were nine in this corps, and from 1st April to 5th June, nine more. On the 6th June a fatal case of cholera occurred; on the 15th, seventeen more, and three of apoplexy; on the 16th, 17th, and from the 17th to the 20th, four to eight daily, all fatal. There were four also on the 23d, three on the 26th, and one on the 27th. Of 112 fatal cases in the 60th Regiment that year, the first of its service in the Presidency, sixty-eight from cholera and six from apoplexy occurred betwixt the 6th and 27th of June. Last year, ending in March, the mortality of the corps was twenty-two in hospital. This year it is thirty-two in hospital, ten in action, and two accidental;—forty-four in all.

78th Regiment.—The 78th and 86th Regiments arrived from England in August 1842. The first was sent to Poona for twelve months, and then to Kurrachee. There, in the quarter ending December 1843, it lost forty-three men, chiefly from fever and dysentery. In the third quarter of 1844, the regiment, divided betwixt Sukkur and Hydrabad, on the Indus, lost 231 men,—141 from remittent fever, the remainder from bowel complaints chiefly. In the last quarter of 1845, the 78th had been removed to Bombay, and lost 276 men, the predominant cause being, not fever, as in the third quarter, but acute and chronic dysentery, to which 244 of the deaths were referred, and six more to diarrœhea, leaving only sixteen for all other diseases. The regiment has been stationed at Belgaum since December 1847, and has there enjoyed excellent health.

86th Regiment.—On its arrival in August 1846, the 86th Regiment was divided betwixt Fort George's barracks in Bombay and Colaba; of seventy-nine fatal cases in the Fort George wing in August and September, seventy; of eleven in the Colaba wing, five were referred to cholera. We find the regiment at Belgaum, by the end of the next quarter, with sixteen deaths there, and four at Colaba for the three months. It enjoyed good health at Belgaum to the beginning of 1844, when it was moved to Kurrachee and Hydrabad, and during its first quarter there lost forty-five men, in thirteen of whom death was ascribed to coup de soleil, and in five to apoplexy. The regiment continued in Scinde till December 1846, and in May encountered a terrific onslaught of epidemic cholera, which, betwixt 14th May and 30th June, carried off 235 soldiers of that corps, being within seven of the number of deaths for the whole quarter. The 86th was brought to Poona in January 1847, its left wing sent to Colaba on the 1st April, and the whole corps to Deesa in December. The regiment has been very healthy since its return from Kurrachee, with exception of the left wing at Colaba, which then lost in 1847–48, twenty-three men, while the right at Poona lost three only.

Here are the relative proportions of admissions and deaths for every month and quarter of the year.

Quarters.	Months.	Admitted.	Died.	Monthly Rate per 1000 to total Admissions.	Monthly Rate per 1000 to total Deaths.
1st	April,	823	18	74	78
	May,	781	7	71	42
	June,	981	17	89	108
	Total,	2585	37	234	224
2d	July	1250	17	114	103
	August,	978	15	89	91
	September,	852	13	77	78
	Total,	3080	45	280	272

Quarters.	Months.	Admissions.	Died.	Monthly Rates per 1000	
				to the whole Admissions.	to the whole Deaths.
3d	October,	868	12	78	73
	November,	975	11	89	67
	December,	901	17	82	103
	Total,	2744	40	249	242
4th	January,	716	12	65	73
	February,	867	13	79	78
	March,	1014	18	92	109
	Total,	2597	43	236	261
	Total,	11,006	165		
	Monthly Average,	917	13¾		

In Sickliness then		In Mortality	
July stands	1st.	March	1st.
March	2d.	June	2d.
June	3d.	July	
August		December	
November		August	3d.
December	4th.	April	4th.
February	5th.	September	
October	6th.	February	
September	7th.	January	5th.
April	8th.	October	
May	9th.	November	6th.
January	10th.	May	7th.

Classes of Diseases.—Of 11,006 admissions in the whole command were returned under,

		Per 1000 of the whole Admissions.	And Died.	Per 1000 of the whole Deaths.
Fevers,	2664 i. e.	242	29 i. e.	176
Eruptive Fevers, . .	10	1	1	6
Diseases of the Stomach and bowels	2054	189	74	448
Diseases of the Liver, . .	541	49	25	151
Diseases of the Lungs, . .	606	55	15	91
Diseases of the Brain, . .	104	9	7	42
Dropsies, . .	3	27	2	12
Rheumatic affections, .	735	67	3	18
Venereal diseases, .	2020	183	2	12
Abscess and ulcers, .	786	71	0	0
Wounds and injuries, .	688	63	1	6
Punishment, . .	11	1	0	0
Morbi oculorum, . .	274	25	0	0
„ cutis, . .	31	2·8	0	0
Other diseases, . .	579	53	6	36

From this table it appears that fevers have been less—stomach and bowel complaints and diseases of the lungs more prevalent and more fatal.—Hepatitis more prevalent but less fatal than the same classes of diseases last year.

Fevers.—Of the fevers,

730	were admitted, and	1	died under	Intermittent,
159	... ...	8	...	Remittent,
1771	... ...	18	...	Continued,
2	... ...	2	...	Typhus,
2	... ...	,,	...	Ephemera.
2664		29		

Of the fatal cases, three occurred in the 10th Hussars, eight in the 8th, seven in the 22d, seven in the 60th, and four in the 86th Regiment.

Intermittent.—Of 730 cases of ague, 498 were referred to the quotidian, 232 to the tertian type, one case only terminated fatally in the 60th Rifles at Kurrachee, being complicated with abscess of the liver. That corps admitted there, from April to September, 35, and in the field from October to March, 155 cases. After being encamped about ten days at Roree, intermittent fever attacked the battalion like an epidemic. Sixty-eight cases occurred in November, the greater number within a few days, with five cases of remittent, and nineteen of common continued fever, but none fatal. Almost all the intermittents were severe, with much headach, often persisting through the intervals of the paroxysms. Bleeding by means of leeches applied to the temples was followed by great relief; and purgatives, sometimes also antimonials, were given before the administration of quinine. A moderate allowance of wine assisted much the convalescence. But what contributed most to the recovery was the removal of the patients from Roree across the river to Sukkur, and the shelter of a good roof in a large airy bungalow there. The men at once expressed the relief they felt from the change. Intermittents continued to recur on the march, and a few cases had to be sent to Kurrachee from Mooltan after its capture. In a few men of the 22d Regiment intermittents were complicated with affections of the liver and spleen, increasing their obstinacy, and causing relapses. This disease is not considered endemic at Belgaum, the cases that occurred there being relapses of attacks, first experienced in Scinde and Colaba.

Remittent.—Of 159 admissions for remittent fever, two occurred in the 8th Regiment left wing, one fatal; 117 in the 60th, five fatal; 31 in the 78th; and 115, twelve fatal, in the 86th.

60th on Field Service.—Several of the cases in the 60th were very severe, and required to be left behind at Roree. The five fatal cases all occurred on the campaign; the first terminated the night before reaching Sukkur, after six days' illness, the skin having become intensely yellow the two last days. Two of the fatal cases were ascribed to fatigue and exposure to the sun, in the pursuit of the Seikh army, after the battle of Gujerat. The necessity of carrying on these poor men, in the heat of the day, rendered treatment of no avail. In the 4th case, which occurred on the banks of the Jhelum, to fever of three days' duration were added, first pneumonia, then peritonitis. The fifth and last patient was admitted, in camp at Jumrood, on the 30th March, and appeared next morning to be doing well, but died suddenly the same afternoon. No *post mortem* examination of any of these cases could be made.

78th, Belgaum.—Thirty-one cases of remittent fever occurred in the 78th at Belgaum, chiefly in June and the beginning of July, October, and the beginning of November. The attacked were generally young men, exposing themselves to the sun; the early symptoms, headach, nausea, anorexia, and sensation of burning heat of skin. After admission the headach increased, chiefly in front, with pain in the eyes, slightly jaundiced conjunctiva, nausea, sometimes vomiting, a yellow loaded tongue, dry hot skin, urgent thirst, and oppressed pulse, seldom above 78 in number. Three severe cases required general bleeding. In all the others the urgent symptoms disappeared, in two or three days, under the use of an emetic on admission; leeches, purgatives, and the infusion of chiretta during convalescence, which was in all very rapid.

Continued.—Under continued fever are returned 1771 admissions and 18 deaths; but a more accurate diagnosis would have placed many of these under other heads, since the dissection reports of the fatal cases show that, in different cases, were found hepatic abscess, ulceration of mucous membranes, abscess in the brain, tumour under the same organ, tubercles in the lungs, and similar lesions. Dr Thom gives the name of typhus to two fatal cases.

Prevalence and fatality of Fever at different stations.

During the year	The strength was	Admissions for Fevers.	Deaths from Fevers.	Admissions to strength per 1000.	Deaths to admissions
At Colaba, .	599	361	7	603	19
„ Poona, . .	1109	750	5	676	6·7
„ Kirkee, . .	690	279	3	400	11
„ Belgaum, .	1098	190	0	173	0
„ Deesa, .	1141	471	4	413	8·5
„ Kurrachee, .	1098	335	4	305	12
„ Hydrabad, .	66	46	1	696	22
„ Field service, .	494	227	5	456	22
„ whole command,	6295	2661	29	423	11
Of the cases at Colaba were					
Duty-men, .	514	319	7	621	22
Invalids, .	85	42	0	494	0

Fevers have been in the whole

Command,	25	per 1000 less prevalent	Belgaum, .	16	per 1000 more prevalent
Colaba, .	45		Deesa, .	14	
Kirkee, .	94		Kurrachee,	49	
Poona, .	48				

than last year. And at

Kirkee, .	4	per 1000 less fatal, but in the whole	Command,	1·22	more fatal.
Belgaum, .	6		Colaba, .	6	
Deesa, .	7·5		Poona, .	4	
Kurrachee,	8·4				

Small-pox.—Under eruptive fevers appear 10 admissions for small-pox, 4 in the 60th Rifles (besides one remaining at the beginning of the year), 2 at Kurrachee and 2 in the field; 1 at Belgaum; 1 in the 22d at Poona; and 1 at Deesa. The fatal case occurred in the 60th in a man who had never been vaccinated, and had escaped observation, when he was brought back after desertion, as well as on the inspection of the corps, on embarkation for this command. A second case in the 60th was severe, though not fatal. The rest, in this and other corps, were modified and mild, all the men bearing marks of vaccination.

Diseases of the Stomach and Bowels.—To diseases of the stomach and bowels have been referred 2054 admissions and 74 deaths.

Of these diseases

	The strength was	Admissions.	Deaths.	Admissions to strength per 1000.	Deaths to admissions. per 1000.
At Colaba, .	599	230	18	384	78
„ Poona, .	1109	355	12	320	34
„ Kirkee, .	690	332	2	481	6
„ Belgaum, .	1098	254	11	231	43
„ Deesa, .	1141	321	12	281	37
„ Kurrachee, .	1098	426	13	388	31
„ Hydrabad, .	66	39	0	590	0
„ Field service,	494	97	5	196	52
„ Command .	6295	2054	74*	326	31
Of the	599 at Colaba were				
Duty-men, .	514	190	12	369	63
Invalids, . .	85	40	6	471	150

At Kirkee the proportion of admissions is 69, at Colaba 14 per 1000 smaller than last year; at every other station, excepting only Kurrachee for deaths, the proportion of admissions, as well as deaths, is greater, being an increase in the

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* In these returns, copied from the official in Bombay, 74 in some, 73 in others, are given as the number of cases fatal from bowel complaints. I have adopted 74.

	Admissions.	Deaths.	
Command of	41	5	per 1000 of the strength.
Colaba,	14	30·8	
Poona,	43	9·8	
Belgaum,	4	1	
Deesa,	67	2·8	
Kurrachee,	73	...	

And a decrease at Kurrachee of deaths only 14·7.

Stomach and Bowel Complaints compared with Fevers.—The comparative prevalence and mortality of fevers and bowel complaints at different stations, for the period embraced by the sick returns may be thus shown.

	Fevers.		Bowel Complaints.	
Stations.	Order of prevalence.	Mortality.	Order of prevalence.	Mortality.
Colaba,	3	3	3	1
Poona,	2	6	4	5
Kirkee,	6	4	1	7
Belgaum,	8	8	6	3
Deesa,	5	5	5	4
Kurrachee,	7	7	2	6
Hydrabad,	1	2	8	8
Field service,	4	1	7	2

It appears thus that fevers have been less prevalent and less fatal at Belgaum, more prevalent at Hydrabad, and more fatal on field service than in any other parts of the command; that bowel complaints have been most prevalent at Kirkee, most fatal at Colaba; and least prevalent, as well as least fatal, at Hydrabad.

Specific Stomach and Bowel Complaints.—To stomach and bowel complaints have been referred

	Admitted.	Died.
Peritonitis,	6	3
Gastritis,	4	...
Enteritis,	6	...
Dyspepsia,	339	...
Acute dysentery,	529	47
Chronic ,,	149	19
Diarrhœa,	955	5
Cholera morbus,	7	...
Constipation,	95	...
Colic,	163	...
Total,	2054	74

Peritonitis.—Of the three fatal cases of peritonitis, two occurred in the 22d Regiment at Bombay and Kurrachee, and one in the 8th, also at Kurrachee; the three of recovery at Belgaum and Deesa.

Dysentery in different Corps.—Of 678 cases of dysentery, acute and chronic, 66, or nearly one-tenth, terminated fatally. Of that number

The	10th Hussars	admitted	76	and lost	3
„	8th Regiment	„	152	„	4
„	22d „	„	192	„	27
„	60th „	„	110	„	14
„	78th „	„	65	„	10
„	86th „	„	76	„	8
		Total,	671	„	66

The mortality has thus varied in different corps from one in seven and six and a-half of the admissions in the 22d and 78th, to one in 38 in the 8th Regiment.

8th Regiment.—During the first eight months of its Indian service, ending 31st March 1847, fifteen cases of dysentery occurred, and two died, in the 8th. The second year, 50 occurred, and one died; this, the third year, 155 occurred, and four died,—two at head quarters, two in the left wing, Colaba.

22d Regiment, Colaba.—This disease was extremely prevalent and fatal in the left wing of the 22d Regiment at Colaba, from October to the end of January; and in that short interval, out of 56 admitted, eleven men died.

78th, Belgaum.—At Belgaum, 49 men were the subjects of 77 attacks,—46 acute, 31 chronic. Twelve of the acute cases took place in June, eight in August, 24, or more than one-half, in May, June, and July.

86th, Deesa.—At Deesa the disease was most prevalent in September, October, and November, a period of the year when, at that station, the ground and atmosphere are humid, and the nights begin to be sharp and keenly cold, and the surface of the body, after being heated and relaxed during the day, is suddenly exposed to cold winds at night. Of 84 admitted at Deesa, eight died,—four being old soldiers who had come out with the regiment in 1842, four recruits of last year. The first were all chronic cases; and in three of them large abscesses were found in the right lobe of the liver; in the fourth, this organ was softened, friable, and of a nutmeg colour. In the four recruits, again, the disease was acute; only one had slight signs of hepatic disease; the lining membrane of the large intestines was highly injected, thickened, friable, and marked by patches of abrasion, with an inflamed appearance of the Peyerian glands; while in the old soldier it was thick like felt, less vascular, interspersed with old, circular, deep-seated ulcers, and the glands of Peyer were round and tumid, but hardly red. Two only of 27 fatal cases in the 22d Regiment occurred in recruits. Ulceration of the large intestines was found in all; and in four this was combined with hepatic abscess.

60th, Kurrachee and the Field.—Last year, at Kurrachee, the 60th had 176 cases of dysentery and diarrhœa, ten of them fatal. This year, six months in Kurrachee, and six in the field, they had 223, and fourteen fatal. But of the deaths, three only occurred in the field, and two of these were attacked at Sukkur, where they had been left behind with fever, leaving only one fatal case in the field, in a man otherwise diseased and hectic. Six of the fatal cases were complicated with hepatic abscess. From the paucity of fevers, pulmonic and bowel complaints, in the 60th during the second half of the year, Dr Boyes considers the active duties of field service to have exerted a prophylactic influence against these diseases.

78th, Belgaum.—Seven fatal cases from dysentery, one returned under diarrhœa occurred at Belgaum in June, four in July, September, November, and March. In three, hepatic abscess was found on dissection, in one tubercles, in one inflammation, and in two enlargement of the liver, leaving two only without complication.

Diarrhœa in the 22d.—Diarrhœa like dysentery was most prevalent in the south-west monsoon, from June to October. In a fatal case returned under rheumatism in the 22d Regiment, chronic diarrhœa, which the patient had concealed, appeared to have been the cause of death. The spleen was found much enlarged, the coats of the large intestines thickened, and internally granular.

86th, at Deesa.—The worst cases of diarrhœa, and three-fourths of the whole admissions at Deesa, occurred betwixt June and November. The four fatal cases in the 86th were connected with hepatic disease, and two with a scorbutic diathesis. In one were found patches of congested vessels in the mucous membrane of the jejunum, and small points of ulceration in the cæcum and colon; in another, ecchymosed spots in the small, and ulcerated spots in the large, intestines, with one on the peritoneal covering of the rectum; in a third, purplish spots on the convolutions of the ileum, much resembling the ecchymosed patches that appear on the legs of scorbutic patients. There was effusion of serum tinged with blood in the right side of the chest; and in the last, as well as this case, the blood was watery from deficiency of fibrine. In the fourth fatal case, the mucous lining of the stomach and duodenum was thickened and vascular, with abraded and ecchymosed patches. The large intestines were also thickened, and studded internally, with similar patches and ulcerations. The kidneys were large, pale, soft, and flabby, presenting the appearance of Bright's disease.

Hæmatemesis.—Hæmatemesis was brought on by a soldier of the 86th Regiment swallowing an execrable compound, sold in the Deesa Bazaar by the name of Eau-de-Cologne. A bottle of this, purchased for four annas (sixpence), had been divided into four fiery drafts, and swallowed, diluted with water. He was brought to hospital, sallow, bloated, and vomiting up grumous blood. The *Tinctura Muriatis Ferri* was exhibited, and he recovered.

Cholera.—Seven admissions for cholera appear in the returns, three at Colaba, one Poona, one Belgaum, and two Deesa; but there have been no deaths from that disease during the year.

Hepatitis in Different Corps.

To Acute Hepatitis are referred,	253 admissions.	12 deaths.
„ Chronic	248 ...	13 ...
„ Icterus	40 ...	... ...
Total,	541 ...	25 ...

Of these occurred in the		
10th Hussars, . .	65 admissions,	2 deaths.
8th Foot, . .	116 . .	3 ...
22d	120 ...	5 ...
60th	71 ...	5 ...
78th	75 ...	2 ...
86th	34 ...	9 ...

10*th Hussars.*—In almost all the fatal cases were found hepatic abscesses. The two in the 10th Hussars had been opened by incision before death; but in both other abscesses existed beyond reach of the knife.

86*th.*—In a case in the 86th, fluctuation was perceptible in the right hypochondrium; but the abscess being deep-seated, and the man in a sinking state from diarrhœa, no attempt was made to empty it. A man of the Horse Artillery, with a large abscess projecting under the right false ribs, was sent to the 86th hospital, and about two pints of pus taken off by a trocar; but the sudden removal of the support given to the circulation by the contents of the abscess was too much for him, and he died. A small portion only of the left lobe had been left to perform the function of the whole organ.

8*th.*—Three fatal cases, or one 1 to 39 of the admissions occurred in the 8th Regiment. One of them had been treated for dysentery in January 1848, and for fever in January and February 1849. During convalescence from the last attack, he was seized with rigors and signs of hepatic inflammation, and died in sixteen days. Three pints of purulent matter were found within five lines of the surface of the liver, and cicatrices and irregularities of surface, from former ulceration, in the stomach and large intestines. In the 22d Regiment, the preceding year, there were only 47 cases of hepatitis, and one fatal. This year there are 114 and five fatal.

38 cases and	4	deaths at	Colaba.
53 ...	1	...	Poona.
14 ...	...	...	Kurrachee.
9 ...	...	...	Queen's Depôt.

In all the fatal cases, excepting one, abscess of the liver was found: in that case the gland was enlarged, and the large intestines extensively ulcerated. Together with hepatic abscess, in another case was found aneurism of the aorta which had not been suspected during life. The 60th had last year 108, and this year only 71 admissions, but five deaths.

36	occurred and	3	died at	Kurrachee.
27	„	0	„	Head Quarters.
9	„	2	„	Invalid Depôt.

None that could be considered severe came under treatment in the field till towards the end of the campaign.

78th.—At Belgaum, 49 individuals have been the subjects of hepatitis; of these, 18 occurred in 700 men who had been about three years in India, 31 in about 450 men of longer residence. The two men who died, and one officer of the 78th, had hepatic abscess, which in one of the men had pointed on the back, been opened by incision a fortnight before death, and large quantities of matter discharged. In the other fatal case large quantities of grumous blood had passed before death from an abscess in the liver, and the large intestines are described as gangrenous.

86th.—The disease was unusually severe in the 86th Regiment, and the cause of very nearly one-third of the mortality. Of 94 admissions, including six of icterus, nine died, seven with and two without hepatic abscess. In this, too, as in other corps, many attacks of dysentery and diarrhœa were complicated with liver diseases. Four of diarrhœa had deep-seated abscess, and four mere enlargement, schirrous hardening or nutmeg discoloration of that gland. The passive formation of matter in the centre of the liver without much pain was the usual character of the disease in the hot and humid months of the monsoon; while the acute attacks, attended by febrile excitement and pain in the side, were peculiar to the months of January and February, when the air was cold and dry, and sharp east winds prevailed. The abscesses were generally confined to the right lobe, and in two-thirds of the cases were pointing through the diaphragm towards the lungs, in which direction one had actually burst, partly into the thoracic cavity, partly into the lungs. In two instances the abscesses were pointing through the concave surface of the liver towards the abdominal cavity, and one appears to have just given way behind the pyloric extremity of the stomach.

In one case the abscess burst into the pericardium. The man in whom this termination took place had been several years in India, and had undergone several attacks of hepatitis. In the last of these he was suddenly seized with diarrhœa, prostration of strength, and occasional fits of dyspnœa; at one time he gasped for breath, and the next visit was comparatively free from suffering. He complained, however, of pain in the cardiac region, and the functions of the heart were disturbed. After being quiet in bed he sat up, and in an instant dropped back dead.

The pericardium was found to be enormously distended with greyish purulent matter tinged with blood, which, as often as it was removed from the pericardial sac, was replaced by a fresh gush from an opening through the diaphragm, of a large abscess, containing a pint of pus in the right lobe of the liver, which communicated with the pericardium by a passage through the mediastinum, large enough to admit the finger. The heart was covered with flakes of coagulable lymph.

Lungs.—To diseases of the lungs are referred to.—

	Admissions.	Deaths.
Pneumonia, ...	33 ...	3
Pleuritis, ...	11 ...	,,
Bronchitis, ...	16 ...	,,
Hæmoptysis, ...	11 ...	1
Phthisis pulm.,... ...	11 ...	9
Acute catarrh, ...	408 ...	1
Chronic, ...	98 ...	1
Asthma, ...	3 ...	,,
Dyspnœa, ...	10 ...	,,
Total,	601* ...	15

In different Corps.– Of these numbers were in the

	Admissions.	Deaths.
10th Hussars, ...	118	1
8th Regiment, ...	173 ...	8
22d ,, ...	40 ..	1
60th ,, ..	124 ...	2
78th ,, ...	38 ...	3
86th ,, ...	113 ...	1
	606	16

Catarrh.—Catarrhal complaints were chiefly prevalent in the colder months of the year. Of 94 admissions at Deesa, 63 occurred in December and January, and only two in April and May; the first the coldest, and the second the hottest months there. Rheumatic pains were a common concomitant, and the mucous membranes of the alimentary canal sometimes particip in the irritation of the air passages.

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* Five admissions have been inadvertently left out of this return, the number being 606, as stated under the *admissions* in different corps.

Pneumonia, 8th.—The fatal cases of pneumonia, three in n ber, all occurred in the 8th Regiment, in men whose constituti had been impaired by other diseases. In addition to grey hep zation of their substance lymph, effused on the pleura, was fo in one, with traces of previous inflammation in the liver; an another numerous small abscesses, with one large cavity and cr tubercles in the lungs.

Phthisis Pulmonalis.—Eleven admissions only and nine de are referred to *phthisis pulmonalis.* Four of the fatal cases occu in the 8th Regiment, two in the 78th, one in the 10th Huss 60th, and 86th, respectively. During the last three years of 8th Regiment's home service, thirteen casualties are returned der phthisis from an average strength little above 800. In same period of Indian service the deaths from tubercles amo to nine, while the average strength is 1100. Two remained the beginning of this year in the 8th Regiment, and four were mitted; of these four died in hospital, one in quarters, one was invalided. In four the disease appeared due to her tary predisposition. In one case the mesenteric glands were larged, and the seat of small semitransparent tubercles; and th were several well-defined ulcers in the small intestines.

60th.—The pulmonic complaints in the 60th were few and little importance; one man died of hæmoptysis, one of phthi the former combined with *delirium tremens.* A fatal case retur under hydrothorax more properly belonged to phthisis. Seven five cases of catarrh occurred, the first six months at Kurrach 40 the second six in the field.

Brain and Nervous System.—To diseases of the brain, or ther nervous system, have been referred,—

	Admissions.	Deaths.
Phrenitis,	4	1
Cephalalgia,	11	0
Apoplexy,	7	3
Paralysis,	12	1
Epilepsia,	18	1
Amentia,	15	0
Mania,	2	0
Delirium tremens,	33	1
Vertigo,	2	0
Total,	104	7

Delirium Tremens.—Of 33 admissions for *delirium treme* nineteen, or above one-half, occurred in the 8th Regiment; t these were confined to a few individuals, the victims of habit drunkenness. The fatal case occurred at Colaba, in a colo sergeant of superior attainments, who could not give up the destructive habit, though he had been previously three times under treatment for the disease. The fourth attack terminated fatally with an epileptic fit, four days after his admission. This is the only fatal case out of 33 attacked in the command.

Tetanus.—In the same corps at Colaba occurred a fatal case of tetanus. The patient, 23 years old, when admitted, 27th July, had laboured some days under severe neuralgic pains of the left eye, with dimness of vision, the lower jaw was firmly closed on the right, but allowed a teaspoon to pass on the left side, towards which the lips were drawn; there was partial ptosis of the eyelid, stiffness of the sternomastoid, and puffiness of the left masseter muscle, but no loss of sensation. He had received no injury, and could assign no cause. Leeches, cupping, calomel, opium, and various other remedies produced temporary relief only, and he died after several attacks of convulsions on the 11th August. The brain was found congested; there were patches of soft lymph on the hemispheres; three drachms of reddish serum were contained within the vertebral cavity, and vascularity and lymph were observed within the vertebral cavity on the spinal cord.

Apoplexy.—Of six cases of apoplexy three terminated fatally, in the 22d, 78th, and 86th Regiments. In the first of these the man went to bed in perfect health, and awoke at two in the morning, complaining of pain in his throat. At daylight he was found to be insensible, and taken to hospital, where he died in an hour. Slight congestion of its vessels was the only morbid appearance detected by a careful inspection of the brain.

78th Regiment.—The 78th case occurred in a man 26 years old, previously in good health, who came into hospital on the 3d May, with severe headach, of some days' duration, heat of skin and foul tongue. The headach continued, and a month after admission it was observed that he had slight ptosis of the left upper eyelid, contraction of the left pupil, while the right was rather dilated. On the 12th June he was seized in hospital with coma, from which he could be temporarily roused, but quickly relapsed; pupils greatly dilated and sluggish; breathing laborious, incontinence of urine; and apparently pain on pressure over the whole abdomen, more particularly in the right hypochondrium; partial paralysis of lower limbs; pulse weak and sluggish; tongue slightly furred. After leeches, a blister and purgatives had been exhibited, he was quite sensible. On the 14th, he had a return of all the symptoms, though less severe. On the 16th, with partial paralysis of the lower limbs, his mental faculties were clear, and he was able to sit up in bed. After the application of a blister to the sacrum, involuntary starting of both legs came on, yet he improved to the 21st, when he had another apoplectic seizure, and died on the 23d. The *dura mater* was found thickened, and firmly adherent to the right parietal bone, the brain congested with fluid in the lateral ventricle, base, and spinal canal, the right *thalamus opticus*, and *corpora striata* much softened, the left being healthy, adhesion of the pleura to the lungs, which were otherwise healthy, and of the pericardium to the heart, the ventricles enlarged, but valves sound. The third case occurred in an Irish recruit, who was admitted at Deesa, with head symptoms, at first resembling those of the prevalent fever, but suddenly terminating in serous effusion. The brain was found congested and softened, with two ounces of fluid in the lateral ventricles and base.

86*th Regiment.*—The following interesting case of recovery from *coup-de-soleil* occurred at Deesa in a man who had been treated for *delirium tremens*, two years previously. He had been at morning parade, and was brought to hospital about 11 A.M., on the 29th March, in a state of perfect insensibility, with his eyes open, fixed, and insensible to light, and the pupils not contracted; the breathing stertorous, with low moaning; the left pulse thready, sometimes scarcely preceptible; the right slow and small; face pale; head hot, with occasional convulsive shivering of the muscles of the arms and legs. He was placed under a punkah, his head covered with spirituous lotions. Under the punkah, the thermometer fell to 64° from 98° in the shade. Two drops of croton oil and a turpentine enema were exhibited. At one P.M., the pulse became quicker, signs of returning consciousness could be traced, his face was pale, and his head, from the continued evaporation, felt as if it had been covered with ice. At two P.M., the stertorous breathing had ceased, and, on being spoken to loudly, he moved his eyes in a vacant manner towards the bystanders. Soon after, he turned on his side, and fell into a kind of half-sleep. From this time he daily recovered.*

Rheumatic Complaints.—To rheumatic complaints are referred 725 admissions and three deaths.

Acute rheumatism, ...	243
Chronic, ...	459
Lumbago, ...	21
Odontalgia, ...	2

Rheumatism is often of syphilitic origin, and renders many men inefficient. At Belgaum, 161 cases, being 73 fewer than last year, occurred in 92 men, 69 of them relapses; 108 were considered of venereal origin.

22*d Regiment.*—Of three fatal cases, one occurred in the 22d Regiment, two in the 78th. The cause of death in the first was chronic diarrhœa, which the patient had concealed when under treatment for syphilitic rheumatism, until within a few days of his death. Both the cases in the 78th occurred at the invalid depôt. One of them had been treated for primary venereal symptoms without mercury, followed by extensive suppuration in left groin, and rheumatic pains, which wore out his strength. The other had been invalided from his corps, not for this disease, but for chronic dysentery, with enlarged liver and painful distension of the abdomen.

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* See the sequel of this case, under Paralysis in Part iv.

Venereal Diseases.—Venereal diseases are a sore evil in this presidency. They furnish above one-sixth of the whole admissions, swell the sick list, deprive the ranks of able-bodied men, and ruin the constitutions of many, rendering them unfit for service.

To this class are referred

Primary Ulcers,	694
Bubo, simple and syphilitic,	500
Phimosis and Paraphimosis,	7
Gonorrhœa,	409
Hernia humoralis,	188
Strictura,	10
Secondary syphilis,	209
Cachexia syphiloidea,	3
Total,	2020

Strictura, 60*th.*—One case of strictura and one of *cachexia syphiloidea* terminated fatally.

The case of stricture occurred in the 60th Regiment on the line of march in pursuit of the enemy to the Jhelum. The man, though suffering for several years from bad stricture of the urethra, had not complained of it since 1844, when on detachment in Ireland he had retention of urine, which was relieved by the introduction of a very small catheter. On the 26th March last he was again attacked with total retention,—no catheter in camp, the smallest to be procured being No. 6, would pass. Fomentations, purgatives, enemata, antispasmodics, and opiates failed in producing any flow of urine until late in the evening, when, after repeated doses of morphia, it began to dribble, and several times he voided it in the quantity of a tablespoonful with considerable relief. His stomach was then emptied by an emetic, and full vomiting encouraged by warm water, after which he passed a little more urine and felt much easier. He was left with directions to have a few more doses of morphine at intervals, until the urine should flow more freely, or he should fall asleep. He slept from 2 P.M. to 5. He then awoke, got up, and passed about a pint of urine; spoke cheerfully to the men about him, and lay down again. On visiting him about an hour and a half afterwards, Dr Boyes found him comatose, and, fearing it might be the effect of opiates, though they had not been repeated, the stomach was washed out by the pump, and stimulants introduced. The skin continued warm, and the pulse of great strength; but when the tents were struck for the day's march, he died, while being placed in a dooly.

The fatal case returned under *cachexia syphiloidea* occurred in the 78th Regiment in a scrofulous subject, who laboured also under dysentery and diseased liver.

Syphilis Primary.—Of 216 cases of primary syphilis in the 78th Regiment, 68 were treated by mercury and local applications, and 17 cases of secondary disease followed; while in 148 treated by local applications only, 27 secondary diseases or rheumatism followed; 78 individuals, furnish 123 cases of secondary syphilis, 103 additional cases under rheumatism had a syphilitic origin, many of them being relapses. In whatever way the primary symptoms may be treated, secondary constitutional symptoms, as pains of the large joints, tibial periostitis, and cutaneous eruptions, are very numerous; secondary syphilitic ulcers of the skin have been less frequent. Ulcers of the palate and tonsils occasional; ulceration and desquamation of the bones of the nose in one instance. Of 42 cases of ophthalmia treated in the 78th, 11 were of syphilitic iritis. Sixteen men of that corps were invalided for secondary syphilis.

Ulcers and Abscesses, Wounds and Injuries.—Under ulcers, phlegmon, paronychia, and fistula, have been returned 786; and under wounds and injuries, 588 cases; comprising 24 gunshot wounds in the 60th Regiment, though the returns gave 34 from the re-admissions of ten men at Kurrachee; 23 occurred at Mooltan, and one at Goojerat; twenty were gunshot wounds, eighteen of the limbs, one of the pelvis, one of the face, four contused wounds. Few of them were of much importance.

Punishment.—Eleven men, that is, less than 2 per 1000 of the strength, have been subjected to corporal punishment during the year.

Ophthalmia and Cutaneous Diseases.—For ophthalmic diseases the admissions have been 274, and for cutaneous 72, including 41 of scabies in one corps.

Other Diseases.—Under other diseases are placed of

	Admissions.	Deaths.
Cynanche tonsillaris, ...	90	...
,, parotidæa, ...	1	...
,, trachealis, ...	2	...
Morbi cordis et palpitatio,	61	...
Hæmorrhois, ...	70	...
Splenitis, ...	66	1
Otitis, ...	44	...
Scrophula, ...	44	...
Scorbutus, ...	32	2
Erysipelas, ...	11	1
Dracunculus, ...	15	...

	Admissions.	Deaths.
Vermes,	14	...
Dysuria,	12	...
Verrucæ,	12	...
Nephritis,	7	...
Neuralgia,	7	...
Dysecœa,	7	...
Morbus coxæ,	4	...
Hydrocele,	3	...

Epistaxis, two, and one respectively of hydrarthus, nostalgia, contractura, eneuresis, sarcocele, calculus renalis, hernia, and prolapsus ani.

Among these are returned six fatal cases,—one of carditis in the 60th, splenitis in the 22d, erysipelas in the 8th, two of scorbutus in the 86th.

Erysipelas in the 8th Regiment.—Seven cases of erysipelas occurred in the 8th Regiment; that which terminated fatally was admitted on the 9th April;—the form was phlegmonous on the right side of the head and face. He died in ten days from the disease, in Dr Tice's opinion, spreading to the membranes of the brain, which were found injected with vascularity of its substance, and two ounces of serous effusion in the lateral ventricles. Part of one ramus of the maxillary bone was in a state of necrosis (caries).

Affections of the Heart.—Disordered action of the heart has been more prevalent in the 10th Hussars at Kirkee, and 78th Regiment at Belgaum, than in any other corps; fifteen cases occurred in the former, thirteen in the latter, six in the 60th, six in the 86th, and four in the 22d Regiment, one of the last fatal. How many of these were re-admissions during the year is not specified, excepting in the 78th Regiment, in which there were sixteen cases, including three in hospital at the beginning of the year; in eight individuals, one being twice, one thrice, and one five times under treatment. The symptoms were chiefly those of hypertrophy, sometimes of dilatation, rarely if in any case of valvular disease. Several of the 78th had previously been treated for rheumatic complaints. Four of them, and nine of the 10th Hussars, after being in hospital for months without improvement, were invalided or sent home for change of air.

Splenitis, 22d.—Of 66 cases returned under splenitis, one died in the 22d Regiment. Chronic enlargement of the spleen from fever is frequently obstinate and intractable. Dr Currie, on recommendation, made some of his patients eat daily from eight to twelve limes seasoned with pepper. Under this treatment in several cases the size of the organ appeared to be very rapidly reduced; in others it remained stationary. The person in whom occurred the fatal case, had repeatedly suffered from fever, as he did on his last admission, with great emaciation, debility, epistaxis, and irritability of stomach. The spleen was four times its usual size, and the liver also enlarged.

Scorbutus.—Of 32 cases returned under scorbutus, 28 occurred at Deesa and two terminated fatally. They appeared chiefly after the hot and moist weather in October and November, and in men who had been long confined to hospital, especially invalids going to Bombay, weakly men out of hospital and grenadiers. Dr Thom considers these last as predisposed to scorbutus, cholera, and other humoral diseases, simply by their length and the greater force required in the circulating system than in men four or five inches shorter. In the two fatal cases the blood was found to be thin, dark, and incapable of coagulation; the cavities of the heart destitute of their usual fibrine, and sanguineous serum in the pleural and peritoneal cavities.

The supply of vegetables for the troops at Deesa is scanty and precarious in the dry season; but government having lately sanctioned the construction of two plunge-baths for the use of the Queen's Regiment stationed there, it is to be hoped a vegetable garden, to be cultivated by the men, and supplied with water from them, as recommended to the authorities, will be added and furnish a sufficient supply of vegetables at all seasons.

Epidemic Diseases.—There has been no epidemic disease among the Queen's troops during the year.

Influence of Age and Tropical Service.—The following tables give the numbers and proportions of admissions and deaths at different ages and lengths of service in India.

Of Age.

Age.	The strength was	Admissions.	Deaths.	Ratio per cent. Admissions to strength.	Deaths. to strength.	Deaths to admission.
Under 18 years,	62	139	0	224	0	0
18 to 20 „ .	647	994	8	153	1·23	$\frac{4}{5}$
21 to 22 „ .	[illegible]500	2544	22	169	1·47	8·6
23 to 25 „ .	1693	3167	51	187	3·01	1·61
26 to 30 „ .	1624	2921	62	179	3·8	2·$\frac{1}{2}$
31 to 35 „ .	609	950	12	156	1·$\frac{9}{7}$	1·$\frac{2}{6}$
36 to 40 „ .	143	270	8	188	5·$\frac{5}{9}$	2·917
41 to 45 „ .	9	18	2	200	22·2	11·1
46 to 50 „ .	3	...	...	...	...	...
Age unknown, .	5	3	...	60	...	...
Total,	6295	11006	165			

Service in India.

Age.	Strength.	Admissions.	Deaths.	Ratio per cent. Admissions to strength.	Deaths to strength.	Deaths to admission.
Under 1 year, .	513	1297	28	253	5·4	2$\frac{1}{5}$
1 to 2 „ .	734	3020	38	411	5·2	1·2
2 to 3 „ .	2746	3169	34	115	1·$\frac{2}{9}$	1·47
3 to 4 „ .	611	762	20	124	3·2	2·6

				Ratio per cent.		
Age.	Strength.	Admissions.	Deaths.	Admissions to strength.	Deaths to strength.	Deaths to admission.
4 to 5 „	281	529	10	188	3·5	1·9
5 to 6 „	291	375	8	128	2·7	2·13
6 to 7 „	715	1201	16	168	2·2	1·3
7 to 8 „	679	1014	16	149	2·3	1·5
8 to 9 „	6	8	...	133	...	...
9 to 10 „	45	40	1	88	2·2	2·5
10 to 11 „	9	7	...	77	...	...
11 to 12 „	16	13	...	81	...	...
Above 12 „	12	10	3	83	2·5	30

From the first of these tables sickliness and mortality appear to have increased with age, from 20 to 45, though not progressively. The age 31 to 35 follows 18 to 20 in order of prevalence, and 21 to 23 in order of mortality. Men 26 to 30 also give fewer admissions than men 23 to 25. From 62 men under 18 years old there is no fatal case, but the proportion of admissions exceeds that at any other age.

The second table shows the large proportions of admissions and deaths that occur during the two first years of tropical service.

Every attention is given to the vaccination of the children of the Queen's troops, by government vaccinators, throughout the command; and to the re-vaccination of men who have unsatisfactory marks of that operation or of small-pox. A case of variola having appeared in a man of the 8th Regiment, who bore good marks of vaccination, Dr Tice became desirous of re-vaccinating all who had never been attacked with small-pox. The division of the regiment twice during the year prevented the completion of this design. Three hundred and sixty individuals only were subjected to the operation. Of these 195 men bore satisfactory marks of vaccination, and the operation succeeded in one only; 159 bore doubtful marks, and the operation succeeded in 140. In one officer, bearing satisfactory, and 5 bearing doubtful marks, the operation failed. It failed in 5 women, of whom 3 had satisfactory, and 2 doubtful marks, and succeeded in two children having doubtful marks. Altogether the operation failed in 218, and succeeded in 150 cases.

ART. II.—*Antiquarian and Medico-Historical Notice of the Rochester and Chatham Leper Hospital of St Bartholomew.*

By THOMAS STRATTON, M.D. Edin.

IN the Edinburgh Medical and Surgical Journal for 1841, (Vol. lvi.), and in the numbers for January and April 1842, (Vol. lvii.), are three highly interesting papers by Professor Simpson, containing Antiquarian and Medico-Historical Notices of Leprosy and Leper Hospitals in Scotland and England. In the third paper, vol. lvii., p. 427, there is a list of hospitals of which he has not given any account or description; in this list, St Bartholomew's at Chatham is named. While residing at Chatham in the autumn of 1849, I took the advantage of the opportunity to make those inquiries, generally conducted most conveniently on the spot, and I now beg to offer the result to the *Edinburgh Medical and Surgical Journal.*

Gundulph, Bishop of Rochester, founded, A.D. 1078, St Bartholomew's Hospital for lepers. It was close to the river Medway, and was in the city of Rochester; the chapel of the hospital closely adjoined it, and was built on ground which is now in Chatham parish. In 1849, the chapel is the only part of the building that is extant. The corporation of the hospital was composed of a head or custos, and an unspecified number of brethren or canons. The head was sometimes called the prior. At first its income was small, and the hospital received aid from the priory or convent of St Andrew. In the time of Queen Elizabeth, it contained as inmates only two invalids. At this time, the ground belonging to the hospital being situated on the banks of the Medway became very valuable, and various persons endeavoured to steal, purloin, annex, or fraudulently take possession of the hospital-land; this was the case, particularly about the year 1579; but these attempts were put a stop to by Lord Burleigh. In the time of James VI., the ground was unjustly granted away to various persons; but about 1627, after much litigation, the right of the hospital to the lands was again settled. About 1627, a Lady Bingley received a sum of money as compensation for a real or an imaginary interest she had in the lands. This money was advanced by the Dean of Rochester, and this sum and the law expenses of the contest were made up by fines on the tenants on the renewal of their leases, and generally from the proceeds of the hospital estate. After about 1627, the hospital revenues were enjoyed by the Deans of Rochester, "as governors and patrons (!) of the hospital and brethren of the same." *

Formerly there were only three brethren, one of whom was a clergyman and officiated as chaplain, or at least received part of the rents as such; but, in 1718, a change was made by the Dean of Rochester; a second chaplain was appointed in the place of one of the *brethren,* who was also to enjoy the privileges and emoluments of a *brother.* Thus, apparently, we have two men officiating as chaplains to a third. In 1773, this brotherly society consisted of four brethren, two of whom were clergymen. The preceding particulars are derived from the *History and Antiquities of*

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* History of Rochester.

Rochester, p. 276, (one vol. 12mo, pp. 326. Printed by J. Fisher, Rochester; no date, but apparently printed in 1773.)

From about 1627 to 1844, or for two hundred and seventeen years, the hospital revenues were enjoyed by the Deans of Rochester, or by the dean and chapter. About 1844, the judges in chancery, on the trial whether the clergy were to be allowed to keep possession of the hospital property, or whether it was to be taken from them, gave judgment against the clergy; but it is said that the present Dean of Rochester was exempted from having to pay the law expenses, as he had not interfered with the hospital-revenue after the matter was disputed.

It is (1849) said that in a few years, when some leases fall in, the hospital property may be easily made to produce a large annual sum. As Bishop Gundulph left this property for the use of those ill of leprosy, it is evident, that now that leprosy is in a manner extinct, the founder's Will will be most nearly fulfilled by devoting the revenue to the benefit of those ill of other diseases, and not, as has been done for more than two centuries, to the benefit of various already overpaid and perhaps absentee clergymen.

As the hospital revenue was not devoted to its intended purpose, it may be interesting to inquire how it was disposed of for the two centuries. It would appear to have been amalgamated with the revenues of the dean and chapter of Rochester, on whose property and its management, so much light, and light so much required, has been thrown by the highly-meritorious and praiseworthy researches of Mr Whiston.* The following particulars are on the authority of Mr Whiston. It may be proper to state, for the information of readers not intimately acquainted with the constitution of the English Cathedrals and Ecclesiastical Incorporations, that by the *dean and chapter* are meant the dean and the canons or prebendaries, who, in the case of Rochester, are five in number. The cathedral statutes mention so many offices to be filled by persons, each to receive a certain salary (of which the amount is stated in pounds, &c.); and at the time the cathedral was either founded or remodelled, the total amount of these salaries equalled the annual income of the cathedral. As land increased in value the nominal rents of the cathedral property amounted to many more pounds than at first. If the rents had been paid in kind, little difference would have arisen. As the value of any nominal sum of money was thus becoming less, it evidently would have been the just and correct course to have continued to divide the cathedral income *in the same proportions* as at first, and among *all* the holders of cathedral situations. Instead of doing this, they paid the same nominal sums to most of the officials and salaried persons, and the six individuals managing the affairs of the corporation (namely, the dean and chapter,) divided the surplus income among themselves, as is most clearly seen in the tabular view here given.

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* 1. *Cathedral Trusts and their Fulfilment.* By the Rev. Rob. Whiston, M.A., Fell. Trin. Coll. Camb., and Head Master of Rochester Cathedral Grammar School. 3d. Edition. 1849. Published by Ollivier, Pall Mall, London. Pp. 126.

2. *Protest, &c., delivered to the Dean and Chapter of Rochester, Sept.* 1849.

3. Mr Whiston is about to publish a *Translation of the Statutes of Rochester Cathedral.*

Rochester Cathedral.

	Original Yearly Income in the year 1542.				Yearly Income in the year 1849.		
Dean,	L.100	0	0	...	L.1426	0	0
Each of the Five Prebendaries,	20	0	0	...	680	19	0
Each Scholar sent to the University,	5	0	0	...	5	0	0
Each Grammar School Boy,	2	13	4	...	2	13	4

Mr Whiston continues to observe, that while the letter of justice, but not its spirit, is meted out to the scholars, who now receive the same nominal sum as they did at first, yet in other instances the letter of the law has been disobeyed, as some salaried situations mentioned in the founder's will, or in the statutes, have been discontinued; others have been continued at a less nominal salary than the original one; and others were attached to other offices established by the founder, which must have been intended to be kept distinct and separate. Most, if not all the other cathedrals in England are in the same state as regards the *management* of the property, of which the deans and chapters are the *trustees.* The incumbents may say they did not commence these practices, but only continued a system they found already in operation. The saying respecting the consciences of corporate bodies will occur to the reader. Another peculiarity about the management of this kind of property is the system of letting land on a long lease, at an enormous premium, to be paid at once to the granter, and a nominal yearly rent afterwards, of a few pounds, to be paid to his successors. Here, also, apologists may say, that the present incumbents found this practice in use.

Connected with his inquiries, and with his continuing to hold the situation of head master of the cathedral grammar school, Mr Whiston became engaged in a law-suit with the chapter. At a meeting of the inhabitants of Rochester, on the 8th of December 1849, the sum of L.200, as a commencement, was subscribed towards the expenses on Mr Whiston's side, and to meet the large sums which might be so readily drawn from the chapter's estates.

Of late, several public meetings have been held to consider the best way of managing the leper hospital estate. Three kinds of claims have been made for a share in the revenues. Canterbury, Maidstone, and other towns in the county of Kent, say, that, as they in all probability originally shared in the benefit conferred by the hospital on the public, by being able to send lepers to it, therefore, they ought now to have allowed them a portion of the funds for any hospitals, or similar institutions, they now have, or may yet have. If there were leper hospitals formerly in those places, there does not appear to be any ground for such applications. But even if there never were leper hospitals in those places, they who are now at last to act on the founder's Will, will have no right to spend any of the money, except upon a building to be erected either in Rochester or Chatham. But it happens that there were at one time no fewer than ten leper hospitals in the county of Kent.

In the second place, an eye institution, two dispensaries, and an infant school have applied for a share of the funds. It is difficult to conceive what claim any kind of school can reasonably have.

And, thirdly, at a public meeting in Rochester on 28th November 1849, three or four clergymen astonished those present by proposing that, as the founder must have contemplated religious instruction for the poor, the funds ought to be set apart for enlarging St Bartholomew's chapel and building a house for the clergyman! After the hospital property had been mal-appropriated for more than two hundred years, the meeting seemed to think the proposal a very cool one. Bishop Gundulph, no doubt, intended the sick inmates of the hospital to have as much clerical attendance as is usually afforded to the patients in modern hospitals.

As an hospital for lepers admitted persons ill of what was generally an incurable disease, and maintained them for life, so the modern St Bartholomew's Hospital of Chatham, in accordance with the spirit of the founder's will, ought not to refuse admittance to those ill of any disease whatever, bodily or mental, acute or chronic, or poor persons unable to obtain their living from being disabled by accident or disease. Such an institution will be a great benefit to Chatham. It is to be hoped that the managers of the hospital property will not make a very common mistake, and expend too large a proportion of the funds on a building too costly and over-ornamented, without leaving enough for the current expenses of each year, including proper salaries to the physicians and surgeons, as these have as much right to be paid for their services as the butchers or bakers have to be paid their bills. Of all vulgar errors, there is not one more gross than the idea prevailing among the public, that there is no occasion for the medical officers of hospitals and dispensaries to be paid for their labours by night and by day, for their time, their disagreeable duties, and the risks they run while encountering infectious diseases in the unpleasant dwellings of the poor. A proper annual sum for every dispensary surgeon ought to be considered as just and unavoidable an item of expense as is the druggist's account for medicines, or the rent of the dispensary building, or the charge for gas or water.

In his *Moral and Political Philosophy* (chap. iv.) Paley has some superficial and incorrect views on this subject. "Of all private professions, that of medicine puts it in a man's power to do the most good at the least expense. Health, which is precious to all, is to the poor invaluable; and their complaints, as agues, rheumatisms, &c., are often such as yield to medicine. And, with respect to the expense, drugs at first-hand cost little, and advice costs nothing, *where it is only bestowed upon those who could not afford to pay for it.*" It certainly costs nothing to those who do not and will not pay for it. If certain classes in the community cannot afford to pay for medical advice, this ought to be provided for them by the general charity of the public (in the same way as these classes are provided with food and clothing), and not by the charity of a few individuals only of the community. Paley might almost as well have said that if butchers and bakers would give away beef and bread to beggars, these articles would cost them nothing, *because* the beggars "cannot afford to pay for them." In the case of a dispensary surgeon acting gratuitously, it is not the poor patients who are the beggars and the recipients of his professional charity; the public at large are the beggars.

In Paley's writings, amid many excellencies and merits, there are several erroneous views. His maxim was, *whatever is is best.* He was an indolent approver of the let-alone system, and precisely the sort of character who, on receiving his fifth or sixth sinecure in the English Church, could sit down complacently, and placidly write a pamphlet entitled "*Reasons for Contentment addressed to,*" *&c.*

The present building called St Bartholomew's Chapel is situated in a small obscure court leading off the High Street, at that point where Chatham and Rochester join. There is a clergyman who officiates once or twice every Sunday. In the Maidstone *Eastern Gazette* of the 4th and 11th December 1849, and in other numbers of that paper, there are notices given of the Chatham leper hospital question, also in the *Times* of 26th November 1849.

I am not aware of what has been done in the matter since the beginning of 1850; but I hope that the cause of justice and of charity has been successful.

March 1851.

ART. III.—*Researches on Cretinism in general, and Abstract of the Report of the Commission named by the King of Sardinia, in order to study this Infirmity.* By M. BOUDIN, Surgeon in Chief to the Military Hospital of Roule. (Archives Generales de Medecine, 4ieme series, T. xxiv. Sept. 1850. P. 65.)

For several years the governments of various States have been occupied in investigations which show their anxiety for the welfare of their respective populations, while they prove that the importance of questions relating to public hygiene is beginning to be understood. At the head of the most remarkable of the labours resulting from these new tendencies, must be placed the report of the commissioners appointed by the English government for inquiring into the sanitary state of large towns and populous villages in England, and the statistical reports upon the army and navy of Great Britian.

Ten years back, the Helvetic Society of Natural Sciences appointed a commission to collect the materials of statistical history of cretinisim in Switzerland. Want of funds and consequent organisation caused the failure of this happy proposition, which, being resumed afterwards in the health councils of the Cantons, will probably produce in their hands better results. Lastly, in 18451 the Piedmontese government appointed a Commission to proceed on an inquiry upon cretinism in the Sardinian States.* This Commission, after having applied to the assemblage of curates, and of all the physicians of the kingdom; and having procured by this means the first information, instructed one of its members, M. Trombotto, to visit the localities specified as possessing Cretins, in order to examine the condition of those persons more narrowly. The researches of this physician, conjoined with five hundred and nineteen returns (519), furnished by the curates of the communes, and with ninety-four memoirs of physicians have been employed as the basis of the report published in 1848 by the Sardinian government. A succinct summary of this we shall endeavour to present.

The Commission defines Cretinism to be a "Degeneration of the Human Race, showing itself in certain regions of the globe, and characterized by a degree of idiocy more or less marked, associated with a vitiated habit of body; and the formation of which depends on causes so extensive, that, in a large portion of the inhabitants, their operation is displayed in a degree greater or less in the regularity of their forms and in the development of intelligence, and of the person."

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* The Commission consisted of M. Gallo, Professor of Surgery, as President; M. Despine, Inspector of Mines; Riberi, Professor of Surgery; Bonino, Physician in Chief to the Army; Sismonde, Professor of Mineralogy; Cantu, Professor of Chemistry; Bertini, Gené, Bellingeri, Professors or Councillors of the Faculty of Turin; and lastly, M. Trombotto.

The ancients have been silent on the subject of cretinism, and the first mention of this disorder is probably found at the commencement of the sixteenth century in the following passage from Felix Plater.

"Some madmen also there are, who, besides innate insanity, are marked by nature with certain defects. Some of these occur in different places, but they are principally found in greater numbers in certain regions, for example the Canton and district of Valais, called Bremis; many of them sitting in the high ways, some of whom were brought to me. I saw them sometimes dumb, with an immense swollen tongue, at the same time in some instances with a swelling in the neck, with deformed appearance. These persons placed before their houses were gazing at the sun with a fixed stare, and with staves between their fingers, and writhing their bodies in various directions, with open gaping mouth, excited the laughter and wonder of those who passed by."[*]

Towards 1574, Simler, in a description of the Valais, expressed himself on this subject in the following terms.

"As to Valais, in some cantons several goitrous patients are found; in others almost none; in some very few. A friend wrote to me that he knew one canton in which are several lame persons, while in the neighbouring canton no one labours under this infirmity. He further states, that there is a canton in which are found several fatuous persons whom they call GOUCHEN, who scarcely deserve to be called men, being similar to the lower animals in using no human food; and that he had seen one of these use horse dung, another who eat hay, and others who went naked the whole winter, and various wonders of the same description, the cause of which is unknown."[†]

Cretinism, mentioned in 1660 by Forest, in 1680 by Wagner, and in 1771 by Haller, was described by Sauvages, Ramond de Carbonnieres, and by Foderé towards the end of the eighteenth century. Since that time, a great number of monographies having reference to this affection have successively appeared. I confine myself to the publication of Michaelis upon Cretinism in the Harz; to that of Haquet in Styria and Carinthia; and some good recent monographies.*

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[*] F. Plateri, Observationes in hominis affectionibus plerisque. Basileæ, 1714.
Sunt et aliqui stulti qui præter innatam stultitiam vitiis quibusdam notati sunt a natura: quorum aliqui passim occurrunt, maxime, vero in certis regionibus frequentiores inveniuntur, uti in Valesio pago, Bremis appellato; plurimos in viis sedentes, quorum aliqui ad me Sedunum delati fuerunt. Vidi interdum lingua immensa et tumida, mutos, strumoso simul aliquando gutture, aspectu deformi, qui ante suas ædes collocati torvo visu solem intuebantur, ac bacillis digitorum interstitiis inditis corpusque varie torquentes, oreque diducto, cachinnum et admirationem pætereuntibus movebant.

[†] Quod Valesianos spectat, in quibusdam pagis complures gutturosi inveniuntur, in aliis prorsus nulli, in quibusdam pauci admodum. Alium quoque pagum se illis nosse amicus quidam ad me scripsit, in quo plures claudicant, quum in proximo pago nemo tali vitio laboret. Item pagum esse in quo plures homines fatui inveniuntur, quos ipsi Gouchen vocant, qui vix homines nominari merentur, bestiis similes ut qui nullo cibo humano utantur; se enim vidisse qui stercore equino uteretur, alium qui fæno, alios qui nudi tota hyeme incederent, et varia huiusmodi monstra, quorum causa in occulto latet.

Cretinism has been observed in Europe, in the Alps, the Pyrenees, Jura, the Harz, and the Carpathian Mountains; in America, in the Cordilleras; in Asia, in the Himalaya range, in the mountains of Thibet, of Tartary, of China. I have never seen it in Algeria; but I have been assured that some cretins have been seen in the mountains of Atlas. Lastly, cretinism has been observed in Bambarra, in the valley of the Niger, and at Madagascar.

In the Sardinian States the principal centre of cretinism is represented by the valleys of the Greek and Pennine Alps; (*Alpes Graiæ*, *Alpes Penninæ ;*) which surround Mont Blanc, the valley of the Doire-Baltée, the valley of the Isere, of the Are, of the Arve, and that of the Oreo. Among a population of 4,125,740 inhabitants, of which about one-half occupies the mountains, and the other half dwells in the plains, there have been enumerated 21,341 goitrous persons, and 7084 cretins.

In France the Counsels of Revision declare annually, from 1200 to 1300 exemptions on the ground of Goitre; and it is to be remarked that the largest proportion is furnished by the single department of the High Alps. Thus, there are calculated as exemptions in consequence of goitre; in the department of the High Alps.

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* Beobachtungen und Bermerkungen uber den an beiden Ufern der Donau in Ober und Unter-Oesterreich haufig vorkommenden Cretinismus (Oester. med. Wochenschrifft, 1848. No. 44).

J. M'Clelland, Geology of Kemaon. Dublin Journal, 1837.

Demme, Ueber endemischen Cretinismus, Eigenthum der Rettungsanstalt fur Cretinen auf dem Abendberg Bern, 1840.

Buek, Vortrag uber Cretinismus und die Möglichkeit demselbem vorzubeugen. Hamburg, 1842.

Otho Thieme, Der Cretinismus. Weimar, 1842.

Rösch, Die Stiftung für Cretinenkinder auf dem Abendberg. Stuttgard, 1842.

Berchtold-Beaupré, Dissertation sur le crétinisme. Fribourg, 1843. (Brochure dont je suis redevable à l'intelligence de M. Guggenbühl.)

Twining, Some Account of Cretinism and the Institution for its cure on the Abendberg in Switzerland. London, 1843.

Extracts from the First Report of the Institution on the Abendberg for the Cure of Cretins, translated by Dr W. Twining. London, 1843.

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Michaelis, Skizzen von der Verbreitung des Cretinismusim Kanton von Argau, Aarau, 1843.

Edward Wells, Essay upon Cretinism and Goitre. London, 1845.

D. A. Chavannes, des Crétins à l'Abendberg (Journal de la Société Vaudoise d'utilité publiqué, No. 145. Lausanne, 1844).

Verhandlungen der Schweiz., naturforschenden Gesellschaft, über Cretinismus, zu Freyburg, Zürich, Lausanne, Chur und Genf; 1840.

Beobachtungen über den Cretinismus, eine Zeitschrift herausg. v. d. Aerzten der Heilanstalt Mariaberg. 1. Hft., grand in-4 (iv.-103 S. m. 2 lith.). Tubingen, 1850.

In 1837	1361	105
„ 1839	1357	86
„ 1840	1281	115
„ 1841	1207	56
„ 1842	1241	80

The following table presents from Piedmont the distribution of Goitre and Cretinism according to the provinces.

Provinces.	Population.	Goitrous.	Cretins.	Cretins in every 100 inhabitants.
Savoy Proper,	148,844	587	304	·20
Upper Savoy,	49,758	1054	362	·72
Chablais,	54,686	133	87	·16
Faucigny,	101,792	741	504	·49
Genevois.	100,905	...	12	.01
Maurienne,	62,344	4339	1418	2·27
Tarentaise	46,688	2160	679	1·45
Aosta,	78,110	3554	2180	2·79
Turin,	369,677	20	29	·07
Ivrea,	160,574	1643	418	·25
Pignerol,	126,998	594	189	·14
Susa,	78,036	82	32	·04
Coni,	168,796	1831	361	·22
Alba,	111,007	2	18	·01
Saluzzo,	148,112	4485	325	·21
Alexandria,	109,739	27	27	·02
Acqui,	92,777	55	...	...
Asti,	127,973	110	18	·01
Tortona,	53,570	18	9	·01
Novara,	186,159	4	49	·02
Pallanza,	95,598	15	7	·07
Nice,	112,428	...	11	09
Oneille,	57,435	397	45	.07
		21,341	7084	

The number of 7084 gives about 17 cretins in 10,000 inhabitants. But if we make allowance for some omissions, it may be admitted that the proportion was above 20 in 10,000. In the number of 7084 cretins enumerated, about 7000 belong to the mountainous part of the territory, or 35 in 10,000 inhabitants; and 84, or four in 10,000, to the population in the plains.

Among 7084 cretins, 5500, that is to say, four-fifths, and among 21,341 goitrous persons, about 13,000, or two-thirds, belong to Savoy and the Duchy of Aosta. In other respects, there is a great difference between one valley and another. Thus, while la Maurienne reckons to the amount of 227 Cretins in 10,000 inabitants,* the Genevese district has only one single Cretin in the same number. Cretinism attains its greatest degree

* In certain parts of La Maurienne, I thought that I remarked that cretinism and goitre constitute the rule, and the absence of these infirmities the exception.

in the valley of Aosta, where it strikes nearly 300 individuals among 10,000 inhabitants.

As to the intensity of the infirmity we find—

Cretins, ...	2165
Demicretins, ...	3518
Cretinous, ...	434
Form of disease not specified,	967

As to age, the cretins are distributed in the following manner.

Under 10 years, ...	331	7084
From 10 to 20 years, ...	1332	
From 20 to 30 years, ...	1339	
From 30 to 40 years, ...	1021	
From 40 to 50 years, ...	444	
From 50 to 60 years, ...	322	
From 60 above that age,	168	
Age not specified, ...	2129	

Sometimes the new-born infant threatened with Cretinism presents already a large and deformed head, which with difficulty he holds erect; the fontanelles are larger than in the normal state. The forehead is almost entirely obliterated by thick hair which approaches the eyebrows; the nose is flattened, the mouth large, the tongue thick; the neck short, is already furnished with a goitre. In other instances there is no sign which permits the observer to infer the future developement of Cretinism.

The stature of the Cretins, when it has attained its greatest developement, rarely exceeds one metre and a-half = 59·05 inches English, or four feet eleven inches in the villages of Aosta and of St Maurienne; and we meet with many who are under three feet, or less than one metre= 39 inches in height. The cretin is usually lean and slender, and his apparent volume is often dependent on œdematous swelling. The skin is of a deep dirty yellow colour. The expression, which denotes the negative state of the intellectual functions, undergoes few changes under the influence of age. I met at Saint-Jean de Maurienne, a cretin female, who had in her features something of the cow. I conjectured her to be twenty years of age, but I was informed that she was sixty; and the native who gave me this information added she is as wicked as a witch. In short, the signs of Cretinism may be summed up in the following manner. The head is badly formed, depressed from before backwards, prominent upon the sides; there is a want of proportion between the different parts of the body, imperfect nutrition, impotence or feebleness of the reproductive organs; absence of muscular energy; imperfection or want of articulate language, and intelligence feeble or entirely wanting.

Cretins are rarely invalids in other respects. In the valley of the Po hernias are frequent; and it is not uncommon to see Pellagra complicate Cretinism.

Pathological anatomy is unquestionably the part which the report of the Sardinian Commission has left most imperfect. Five physicians only have answered to this part of the inquiries proposed, and they have further been silent as to the diseases by which the Cretins examined by them have been cut off. The anatomical facts recorded may be stated generally in the following manner; thickening of the bones of the skull, diminution in the volume of the brain, the substance of the brain itself indurated or softened.

Does the period of conception or of birth exercise any influence upon the development of Cretinism? To this question the commission give answer by the following facts.

Number of Births.

January,	402	August,	370
February,	433	September,	395
March,	446	October,	381
April,	398	November,	380
May,	412	December,	396
June,	343	Not specified,	2403
July,	325		
		Total,	7084

The period of birth appears, therefore, to be void of influence upon the production of cretinism; for from the preceding facts it results that there are 24 births of Cretins in the cold six months, extending from October to March, against 22 in the warm half year, extending from March to October.

In reference to the two sexes, the Cretins and goitrous persons returned are distributed in the following manner.

	Males,	Females.
Goitre,	4323	5236
Cretins without goitre,	1120	891
Cretins with goitre,	1943	1959

From these numbers it appears that, if the female is a little more exposed to contract goitre, on the other hand, the male sex seems to present a larger tribute to cretinism.

Cretinism appeared	Individuals.
From birth to 2 years in	4440
From 2 years to 5 in	187
From 5 years to 12 in	202
From 12 years to 20 in	31
From 20 years and above that age in	28
At ages not specified in	2196
	7084

In goitrous cretins goitre began to appear at the following ages in the following numbers.

	Individuals.
From birth to 2 years in	2333
From 2 to 5 years in	199
From 5 to 12 in	449
From 12 to 20 years in	157
From 20 years and above that age in . .	43
At ages not specified in	711
	3912

Among 4009 fathers of cretin children, it was ascertained that there were born

In an infected district, ...	3915
In a district not infected, ...	62
Without designation, ...	32
	4009

Conditions of these fathers relatively to Goitre and to Cretinism.

Neither goitrous nor cretins, . .	2494
Goitrous, . . .	962
Cretins, ...	51
Goitrous and cretins, . .	106
Without designation, . . .	396

Sanitary state, and external aspect.

Good in .	2068	Bad in .	294
Moderate in .	1096	Without designation in	552

Among 4015 mothers of cretin children the report records that there were born

In an infected district, .	3881
In a district not infected, .	70
Without designation, .	64
	4015

Conditions of these mothers relatively to Goitre and to Cretinism.

Neither goitrous nor cretins, .	2262
Goitrous, ...	1281
Cretins, ...	43
Goitrous and cretins, . .	66
Without designation, . .	364

Sanitary state, and external aspect.

Good in .	1904	Bad in .	370
Moderate in .	1233	Without designation,	508

State of families as to circumstances.

Easy circumstances, .	866
Not easy, . .	1728
Indigent, . .	1361
Without designation, .	54

Upon analysing the statistical documents here given, we find that hereditary disposition performs only a very doubtful part, since, among 8000 fathers and mothers of cretin children, we find not even 300 (266) affected with cretinism. As to the influence of indigence, it loses much of its pathogenetic value, if we consider that indigence is closely allied to the circumstance of dwelling in the situations most strongly exposed to endemic influence.

The exposure, and the physical configuration of the surface, may be indirectly the cause of the insalubrity of a valley, either by modifying the air, or by arresting the direct action of the solar light. In general, the valleys most severely afflicted by cretinism, are those which are deep, narrow, tortuous, and shut up at their extremities. Such, for instance, are the valleys of La Maurienne and several of the lateral valleys to the large one of Aosta.

The direction of valleys appears to have no influence upon the prevalence of cretinism. Thus, around the elevation of Mont Blanc, the valleys of the Isere, of the Are, of the Doire-Baltée, and of the Rhone in the Valais, abound in Cretins, notwithstanding the very different direction of these valleys. Another observation of great uniformity is, that the villages most afflicted by cretinism are situate in secondary valleys, so disposed that the wind blows there constantly in one direction. The Valpelline, the valley of Tournanche, and that of Brusson, in the duchy of Aosta, which are open to the south winds, and closed to all others, are an example of what we here advance. Cretinism seems preferably to reign in closed valleys. The valleys which belong to the centre of the Alpine elevations, La Maurienne, La Tarentaise, Aosta, Faucigny, are all deep narrow gorges; their bottom rarely exceeds the extent of a kilometre; and most frequently the foot of one mountain touches the base of that which is opposite. On the contrary, the valleys of Savoy proper, aud of certain parts of Faucigny, of Chablais, and the Genevan territory, which are less deep and more spacious, either contain no Cretins, or contain a smaller number of these unfortunate beings. To this rule, nevertheless, the valley of the Isere, and the plains of the provinces of Coni and of Saluzzo form an exception. Notwithstanding the extent and the size of these districts, cretinism is met there, as elsewhere, in its endemic state.

Since the time of the travels of M. de Saussure in the Alps, the opinion has prevailed that cretinism disappears at points above 1000 metres (3280 feet) of elevation. M. Maffei, nevertheless, states that he has met with a great many goitrous, idiot, scrofulous, and rickety persons, below the elevation of 1300 feet, but never genuine Cretins. The most of the Cretins are observed, it is true, beneath the elevation of 1000 metres; but might not this proceed from the fact, that the greater part of the land susceptible of cultivation, and most of the dwellings, are found below this altitude. We find cretins at Maurienne, at 1151 metres = 4109·669 feet; at Bramans, at 1256 metres = 4120·831 feet; at Notre-Dame du Villard, at 1304 metres = 4278·315 feet; at Mont Cenis, at 1382 metres = 4534·226 feet; at Albiez-le-Jeune, at 1384 metres = 4540·788 feet; at Mont Pascal, at 1553 metres = 5095·263 feet; and at Albiez-le-Vieux, at 1566 metres = 5137·915 feet. In this last locality, there are enumerated so many as 90 cases of goitre or cretinism in 1000 inhabitants.

The commission specifies in its Report stagnant waters near all the villages where cretinism reigns, at the same time that it dwells upon the diminution in the number of cretins in places in which desiccation has been effected. The potable waters of the localities remarkable for cretins are noticed as very much loaded with calcareous salts, and destitute of bromine and iodine. The facts, nevertheless, lose something of their value, when we remember that at Ivrea, where the water is very bad, there are neither goitres nor cretins, while both disorders abound at Saint Vincent, and in the valley of Aosta, where the potable seems to be excellent.

According to Dr Eschericht,* 1000 young persons examined by the councils of revision furnish annually from 129 to 155 exemptions in lower Suabia, the surface of which is formed almost entirely by the keuper sandstone and the shell-limestone formation. Upon the Jurassic formation of upper Suabia the proportion of these exemptions is reduced to 8 per 1000.

According to M. Falk,† the manifestation of goitre coincides;—
In Kumaon (India) with the transition limestone;
In Wurtemberg with the shell-limestone;
In England and in Siberia with magnesian limestone;
In Switzerland with transition limestone.

In Piedmont the Commission are of opinion that they are entitled to deduce the following general conclusions from the examination of the whole of the localities in which cretinism has been studied.

1. Endemial cretinism is limited in the States of the Continent, to the valleys and plains which belong to the great alpine elevations which have for their centre the three peaks of Monte Viso, Mont Blanc, and Mont Rosa. The infection commences in the first ramifications of the Maritime Alps: it increases in the Cottian Alps; and it attains its highest degree of intensity in the Grecian and Pennine Alps.

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* Eschricht apud Allgemeine Zeitung für Chirurgie und innere Heilkunde, 1843, p. 20.

† Falk, De Thyreophymate endemico per Nassaviam atque Hassiam Electoralem. Marburgi, 1843.

2. The conditions of the different infected valleys, whatever be their direction, resemble each other so much, that any observer who traverses them successively, may believe that he has never gone out of the same valley.

3. The valleys most infected are those which are most deep, most confined, most humid, and those which are most deprived of air and light.

4. The Cretins are met with more particularly in habitations remote from the principal place, in houses most exposed, worst built, apart from the routes formed by commercial intercourse, and contiguous to marshes.

5. In the towns and most considerable burghs through which strangers are frequently passing, it is neither the whole town nor the entire borough which contain the Cretins, but only the part most remote from the centre; it is the streets and houses in which the extension of commerce and the progress of civilization have not yet been able to make their favourable influence be felt.

The different conditions now stated present, nevertheless, numerous exceptions.

As to the curability of Cretinism, the opinions of the most recent authors may be stated in general terms in the following manner.

1. Cretinism is not in all instances incurable.

2. The first years of life are the period best calculated for obtaining a favourable result.

3. The difficulty of ameliorating the situation of cretins augments in proportion as they approach to adult age.

4. The probability of amelioration is in the inverse ratio of the intensity of the infirmity.

5. The cretins in whom the head is very much deformed from birth, appear to be entirely incurable.

6. Amelioration is maintained during the whole course of life, when the child has arrived at the age of nine or ten years, even when he remains under the influence of local causes.

Excepting the attempts made by Dr Guggenbühl, the treatment of cretinism has remained hitherto nearly stationary, not to say negative. It appears to us, nevertheless, that certain analogical facts, as well as the knowledge of some etiological data, ought to give encouragement to attempts at treatment. Would it be a misapplication of therapeutic induction to admit, that the fact of removing cretins from the centres of endemial influence, associated with good hygienic habits and a liberal administration of the preparations of iodine, would be calculated to produce at least amendment in an infirmity so manifestly connected with certain points of the habitable globe, and which further presents many points of connection with goitre, for which iodine constitutes in some degree a specific remedy. When, on the other hand, it is understood that Dr Guggenbühl, who for twelve years has devoted himself with most laudable perseverance to the treatment of cretin children, has not been able, notwithstanding all his applications to obtain hitherto an official inquiry to examine the result of his labours, it may be inferred that the therapeutic capabilities of this infirmity have not received the attention, to which they are entitled.

At the period of an inquiry made by the Austrian government in 1844, at Syrnitz, near Klagenfurt, a person, named Willeger, made the following deposition.—"My father has observed that the strangers who came as domestics into the country, in order to inhabit his farm, took very soon very large necks. From time to time, in proportion as they sojourned a long time in the district, they became more goitrous, and breathed with greater difficulty. At the same time the knees became swelled; the feet became affected by lancinating pains, and became stiff and feeble. In proportion as this state of feebleness and stiffness increased, intelligence also became enfeebled; after the lapse of some years intelligence was altered to a degree so considerable as to pass into cretinism. The persons born on the property are affected by this infirmity in a degree still more considerable. That property was formerly occupied by a family consisting of four cretin children and a semi-cretin uncle. The father of the four children had been also a semi-cretin, a circumstance, however, which did not prevent the two brothers from attaining, the one the age of a hundred and five years, the other that of one hundred years. We observe the same degeneration in the lower animals, especially in the horned cattle, to a degree so great that it is impossible to rear young cattle without remarking vices in growth and internal diseases, and that it is necessary to import from other quarters animals for draught."

"In the domain of the Seignoury of Abbeck the same observations have been made. The present proprietor, after having purchased the property, arrived in it with his first wife, both in good health. The wife died goitrous and demi-cretin, and the proprietor with his second wife have fallen into a state of demi-cretinism. The five children of the first marriage are idiots. Their necks are thick and their persons are stiffened. The children of the second marriage one aged three years, the other one year, are still in good health; but they must expect the same fate as their elder brothers; for these last were healthy in their first infancy."

"It must be remarked that with the stiffness of the feet, the general torpor of the whole frame, the obtuseness in the intellectual faculties, are conjoined also defects in hearing and speech which are aggravated in the course of life. It is also matter of observation that children born in good health begin to experience this disease only in the last years of infancy, and that, in proportion as they grow up, their condition is aggravated, until it is turned into cretinism. The contrary takes place when persons attacked by this disorder change their place of abode, and use for drink water of good quality."

This declaration I reproduce here, without attaching to it more importance than it may deserve.

The Sardinian commission of inquiry concludes by recommending the adoption of the following measures.

" 1. To drain and dry the marshes, especially those along the course of the Doire-Baltee, the Isere, the Are, and the Arve, and to provide with canals the waters of those rivers liable to overflow.

2. To convert the grounds left by the inundations of these rivers into fields, capable of being cultivated as soon as the embankments of the reclaimed lands shall be completed, instead of leaving them in the form of meadows, considering that in this condition it is impossible to dissipate the humidity, and effectually dry the surface.

3. To cut down the plantations of lofty trees at the distance at least of 50 metres from all dwellings, in order that the air may circulate freely, that moisture may not linger there, and that the solar light may be able to penetrate to the soil.

4. In districts in which chemical analysis or experience has shown that the water used for drinking is noxious, to bring proper water from good sources, or, if there be no means of doing this, to correct this defect as far as may be possible by establishing cisterns of rain water.

5. To demolish the dwellings which, by their exposure or by their faulty construction, are recognised as very unhealthy and incapable of being amended.

6. To prohibit the construction of dwellings in localities which are recognised to be unhealthy.

7. To oblige proprietors to construct dwellings according to hygienic rules; to choose a good exposure; to establish large and numerous windows in the new buildings, to open new windows in the old; to construct the houses with two floors, to raise the lower floor above the level of the soil, with a paved floor or a deal floor resting upon a bed of sand, of coal, or gravel: to make the stables and cowhouses elevated, spacious, and well-aired.

8. In the construction of new villages, to remove them from the bottoms of valleys, to place them upon elevations and in points most exposed to the sun and wind, and to plan them with spacious streets paved with pebbles.

9. To maintain everywhere cleanliness; to reserve separate places for the accumulation of manure and all impurities.

10. To erect at the chief place of government a board of health, consisting principally of physicians, investing this board with full power to cause to be carried directly into effect every measure which the preservation of public health may demand.

11. To establish with provision and corn laws, in order to prevent the excessive enhancement of the process of alimentary articles most necessary to subsistence, and to prevent the immoderate use of spirituous liquors.

12. To sell culinary salt (chloride of sodium) at the lowest possible rate, in order that all persons may consume it freely.

13. To encourage the use of animal food.

14. To encourage commerce by all possible means, in order to occupy a great number of hands during the winter season.

15. To open up new roads, and to facilitate the communications of one country with another, in order to attract travellers. The example of La Maurienne is sufficient to prove the immense advantage presented by countries intersected by good roads, even under hygienic relations. It is not doubtful, that, by laying open the road of the little Saint-Bernard, the Tarentaise and the Duchy of Aosta acquire great advantages, not only in commercial relations, but in reference to the state of health.

16. To establish public gymnastic games.

17. To prevent, by all possible means, individuals who have a tendency to cretinism, or who belong to families in which cretinism appears to be hereditary, or who are rickety and scrofulous in a high degree, from entering into the matrimonial state; to favour the crossing of races.

18. To introduce regularity into the performance of obstetrical services.

19. To induce females belonging to families in which cretinism is frequent, to inhabit the elevated parts of the country and other salubrious situations, during the period of their pregnancy, during confinement by labour, and during the nursing of their children.

20. To institute prizes of encouragement in favour of mothers who are most careful in the management of their children.

21. To establish asylums and schools for the management and the instruction of children.

22. To adopt all means for rendering popular the precepts and rules of hygiene.

23. To assemble all the Cretins in an establishment similar to that at Abendberg, and to collect in it those who present any hope that their condition may be amended."

Though these recommendations arise out of the circumstances and causes of the infirmity, it may be doubted whether all of them are practicable. It must be manifest, for example, that the improvement and amendment of old dwellings, and the construction of new ones upon better principles, is very much a question of pecuniary supplies. The reason why the inferior and labouring population in all countries reside in confined, damp, ill-aired, and imperfectly lighted and warmed abodes is simply because, according to the state of society, their means enable them not to procure more spacious, more commodious, and better lighted dwellings; because building materials are often expensive; skilled labour always so; because it is much more expensive to have a well paved stone or deal floor than one of earth; because fuel costs money, sometimes at a high rate; and because landlords and proprietors of the soil are, with few exceptions, rapacious, and determined upon extorting as much money out of their tenants as possible. A house built with two floors is manifestly a much more expensive production than one built with a single floor on the ground; and if the tenant must have such a dwelling for preserving his own health and that of his family, either he must pay for it, or some one must pay for it. No man will occupy a poor miserable dwelling by choice; but these people are obliged to be satisfied with such dwellings, because their means enable them not to procure more eligible dwellings.

It may further be justly asked, what can the inhabitants of these sub-alpine regions do? Born and reared in these cheerless damp valleys, unvisited by the sun, it is altogether out of their power to quit them, as they have no means to enable them to remove to more favourable localities. There they pursue their irregular and not very active callings, and obtain a subsistence which, to their habits, is sufficient in situations, and under circumstances, which to others would seem not endurable. By keeping goats, a few starved cows, cutting woods, hunting, and labouring in various modes, to the small or middling proprietors, acting as carriers of merchandise and agricultural products to the towns and cities, they obtain a subsistence, which, though not abundant, is in many respects sufficient for their wants. It is probable that these valleys ought not to have been inhabited by human beings, and that even for the lower animals, their productions afford but a scanty supply of food. But, under all these unfavourable circumstances, and an incessant struggle against the difficulties of nature, the human race has multiplied, and continues to multiply, until it is too late to separate them from the soil to which they are attached. Were it, on the other hand, practicable to withdraw them from situations so hurtful to health, it is manifest that this is the only effectual mode of stopping the progressive extension of cretinism and goitre among them. Such a proceeding, we suppose, must be regarded as impracticable, since the commission offer not any suggestion approaching to it.

With regard to the establishment of corn laws, and laws regulating the sale of articles of food, all experience demonstrates that the fewer legal enactments are made for this purpose, it is the better. Wherever men have attempted to establish laws for these purposes, they have invariably done mischief. If the prices of articles of food are left unregulated by laws, it is the wise and natural course. Man, however, is a legislating and a meddling being, and, with characteristic wisdom, he thinks that his time is never better occupied than in fixing the price of corn, bread, animal food, and all the articles by which life is supported and rendered comfortable.

It is a grave satire upon that department of civil government which professes to regulate the prices of articles of food, to recommend the adoption of laws to prevent the excessive enhancement of the most necessary articles of subsistence, and encourage the use of animal food, when it is well known, that, among the people in question, wheaten bread, barley bread, or good oatmeal, cannot be obtained; that they are obliged to live from the beginning to the end of the year on maize, rye, and a bitter indigestible article made from the meal of the horse-chestnut, with some milk and oil often rancid, and a dry hard species of cheese; and that animal food is hardly ever seen, except in the shape of dried, and often nearly putrid fish, occasionally dried goats' flesh, and, on more rare occasions, the flesh of the chamois. In some parts of these districts, the inhabitants eat as food the marmot, a species of aliment which could not be used, if food were abundant. As to moderating the price, and facilitating the use of salt, what can be the advantage of such a measure to people, who have no food to be salted; the first object would be to give them food before they provide the condiment.

To the true causes of all this dreadful mischief, the commission have not even given a passing thought. These causes consist chiefly in the feudal rights of the great proprietors, and the severity with which these rights are enforced; the heavy load of taxation under which the lower and working classes are oppressed; the utter inability, in consequence of these circumstances, of the labouring classes ever rising above their condition, or improving their circumstances; the consequent want of a middling class in comfortable circumstances; and in no inconsiderable degree by the ignorance, laziness of body, and torpor of mind, caused by the predominance of the Roman Catholic religion. Whatever the advocates for that form of religion may say, it is quite absurd either to call it Christianity, or to expect that it will produce, or can produce, the benefits resulting from Christianity. It is scarcely entitled to be called a form of the Christian religion. The Roman Catholic religion has been known since the fourth century to be in its mode of worship merely a form of paganism, in which the imagination of the people is gratified with the most imposing rites and ceremonies of the pagan religion, in its faith to be a system of the doctrines and traditions of artful selfish men and sophistical reasoners, and in its morals to be a system in which it is considered how the fundamental obligations of morality may be set aside and evaded. This is not the place for such a subject; otherwise it would not be difficult to show that such a religion, in which the interests of the great mass of the people are altogether sacrificed to those of the church and its members, exercises a most injurious influence upon the great body of the working-classes; and while it finds them miserable, ignorant, helpless, and dependent, keeps them so, and reconciles them to every species of degradation. Whenever this form of religion is established in full force, it fails not to extinguish the energies of the lower and working-classes, and renders them mere machines in the hands of the priests, and those whom they favour. Either it destroys enterprise, and while it favours superstition, impresses the feeling that all exertion is useless; or, if the mind throws off its fetters, it is only to send its subjects to every species of unbridled license and iniquity, fraud, and violence. To this it may be said Belgium and its people are an exception. They are so. But they have become an exception by allowing the Catholic religion to fix only its external forms, not its essential character, upon their institutions.

Regarding the measure of prohibiting from entering into the matrimonial state persons believed to be sprung of cretin families, or exhibiting the cretin disposition, such a proceeding is totally at variance with freedom, and could never be tolerated in any state with even the semblance of free institutions. If persons are actual cretins, then they are idiots, and by the laws of all civilised communities, unable to contract such an alliance; so that, to meet this exigency, the ordinary laws of the country must be quite adequate. In like manner, if a wife or husband become cretin after marriage, then the case is the same as if either became insane or fatuous, and requires no new legislative provision; the laws of the country being quite sufficient to fulfil what each case requires. But the proposal of a legislative enactment to proceed on the principle of persons prospectively becoming Cretins or idiots, is too extravagant and too unreasonable to require being seriously refuted.

In other respects, the recommendations are judicious; and, where they are practicable, promise to exert beneficial effects.*

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* Since the foregoing remarks were in type, very considerable changes in

ART. IV.—*Deleterious Practice of some of the Irish Peasantry connected with the belief in Fairies.* *By* WILLIAM PICKELLS, A.B., M.D., one of the Physicians to the Fever Hospital, Cork.

AT the late Assizes (March 1851), held in Nenagh, county Tipperary, a woman named Bridget Peters, a fairy-doctress, was tried and convicted on a charge of "having caused the death of a child, by administering large doses of the *Digitalis purpurea*," under an idea that the child was suppositious, and that the real child had been stolen by the fairies. The child, it appeared, "was about six years old, and had been delicate almost from her birth, being affected with a softening of the brain and partial paralysis." The culprit, from what was stated on the trial, had pretended to be a sort of savant, or adept in her line. "A book, called Culpepper's Manual, with instructions how the planets acted on each drug, was found on her, and had often evidently been consulted by 'the knowing woman,' as she was called." The digitalis was given by way of decoction.

As tending to demonstrate the mischievous consequences of a practice, of which the above is a fatal instance,—a practice, it is to be feared, still not unfrequent in some parts of the country,—I have thought that it may be not unuseful to republish a paper, which I several years since had printed under the anonymous signature of "A Physician," in a periodical then published in this city, but now out of print, ("Bolster's Quarterly Magazine, August 1828.)" The instances there given had reference only to this county and the city; but subsequent inquiry proved that they might have been extended by reference to other counties. Shortly after, or about the time of the appearance of the paper, the practice, I was informed, was noticed, and animadverted on strongly, in admonitions from the pulpit, by two very influential Roman Catholic clergymen of the city. It is the more necessary to call attention to, and denounce it, as, from the assumed success of *Digitalis purpurea* in the treatment of epileptic children, supposed to be fairy-stricken, it has been sought to raise an argument in favour of its use in the treatment of epilepsy in general. I shall subjoin, as a sequel, a note addressed by me to the editor of the Lancet, (number for December 24th, 1831), in reply to a writer, who had argued from such analogy, its great probable efficacy in the treatment of epilepsy in general.

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the commercial relations, both external and internal, of the kingdom of Sardinia have been introduced, and several legislative enactments calculated to ameliorate the condition of the great body of the people, and their relation to the proprietors, have also been sanctioned by the government; and there is every reason to think that other reforms will take place, by means of which the condition of the inhabitants of the sub-alpine districts shall be very much amended

Deleterious practice in the county and city of Cork connected with the belief in Fairies.

A superstitious belief continues to prevail to a certain extent among the lower orders in this part of Ireland, that children labouring under consumptive, ricketty, or other cachectic and wasting diseases, are in many instances not human beings but fairies in their semblance, substituted by other fairies who had stolen the real children. It is not many weeks since a friend of mine seeing a crowd collected in one of the most populous streets of the suburbs of this city, upon inquiring the cause, learned that it was engaged in looking at a fairy,—that is, a child supposed to be in the literal sense one of these unearthly substitutes. The superstition would be merely ridiculous, and scarcely worthy of notice, but for the deleterious,—the infanticidal practice which has been engrafted on it. This consists in giving a preparation of the leaves of the *Digitalis purpurea*, or foxglove, called in Irish Luss-more, to the suspected child to drink, in order as it were to kill the fairy; the plant, it is supposed, being noxious to this unhallowed tribe exclusively. For this purpose a handful of the fresh leaves is boiled in water, in the manner of cabbage, and of the decoction so prepared, a dose greater or less, but usually considerable, is given to the child. In some instances, I have been informed, even the expressed juice is given, undiluted, in drops. It will be credited without much difficulty, that, under the use of so dangerous an agent, in so rude hands, many lives have been sacrificed. If the child die in consequence of an over-dose, the ready plea is, that not a human being, but one of these unhallowed substitutes was killed. If, on the contrary, under a more restricted management, the little sufferer recover, the fact is considered conclusive, that it is a child not a fairy; the plant exerting, it is believed, a salutary restorative effect on children labouring under the diseases mentioned. Thus the character always ascribed to Luss-more by the common people is, that it either kills or cures. The custom, it will be perceived, bears considerable analogy to the obsolete barbarous mode of trial by ordeal. Though prevalent in many parts of this county, and to a certain extent even in the city, I am not aware, that it has been hitherto noticed in print. My attention was first directed to it, a few years since, by an instance happening to reach my knowledge, in which, from among three children of a family residing in the suburbs, to whom Luss-more had been given, two died. A respectable apothecary who resides in the north suburbs, from long observation of the prevalence of the custom, is led to infer, that, as he expressed himself to me, nothing less than the interposition of the law will put it down. Mr Drummond, Curator of the Botanic Garden near this city, could adduce nearly a dozen fatal instances in his immediate neighbourhood, in each of which a jury, if impanelled, would, he thinks, have had no hesitation in deciding, that death had been occasioned by this criminal practice. In a very recent instance, a mother who inquired of him whether the plant which she submitted were of the true description, having, contrary to his most earnest admonitions, persisted in giving it to her child, the child was found dead on the following morning.

The malevolence of fairies towards the human species evinces itself chiefly, it would seem, according to fairy-lore, in "stealing" and "striking." They are supposed to be especially busy for these purposes on May eve; hence the anxiety of mothers to keep "their little ones" within doors on that "eery," as it is called, "evening."* The children so stolen are carried to far distances "among rocks." By "striking" the notion is that they inflict the diseases of epilepsy or paralysis, either of which, as ascribed to this cause, is emphatically called "a puck." The following melancholy circumstance transpired at the Tralee (county Kerry), summer assizes of the year before last (1826.)

A woman was tried on the charge of drowning a child in the river Flesk. The little sufferer, it appeared, was four years' old, and, from inability to walk, stand, or speak, had been put down as *fairy struck.* The remedy resorted to in this instance,—by advice of the child's grandmother,—was, that it should be bathed three mornings successively in the Flesk, "to drive" the elf "out." In the third bathing, however, having been kept too long under water, the little paralytic was unfortunately drowned. Other inflictions ascribed to fairies besides pucks or strokes are "blasts" and "darts." Erysipelas, particularly of the face, is called "a blast," and is attributed to their "whirling" a blast of wind in the sufferer's face. Sudden swellings or stiffnesses of a joint (*ankyloses*) are "darts."†

The word Luss-more, literally translated, means the "great herb." The more common English names by which the *Digitalis purpurea* is known in this place are "fairie's cap" and "fairie's thimble,"—in allusion to the rich purple bell-shaped blossoms used, as these names import, for caps or thimbles by this fantastic race, though the leaves are so noxious to them.*

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* The word "eery" occurs too in the Scottish dialect, and is defined by Sir W. Scott, "producing superstitious dread." It frequently occurs in Burns's Poems.

† Not long since a peasant from the neighbourhood, who had been sent into the fever hospital with symptoms of fever, upon discovering after admission that his disease was erysipelas, which it turned out to be, cursed and damned the ignorance of the doctor who sent him in, insisting vehemently on my having him removed immediately, saying his "was not a case for the house," meaning that it belonged to the fairy-doctors, and as such was to be cured by charms, not by medicine! On a trial in this city, some years since, about a policy of insurance, the testimony of a hedge-practitioner of this sort, who had attended the deceased during sickness, was resorted to on the part of the Insurance Company.

Of the same natural order with the *digitalis* is the *Scrofularia nodosa*, called in Irish, from the jealous vigilance with which it is guarded by this tiny creation, "Luss-na-var-beg," or, the "Fairies' herb." Taken internally in the crude state, it is esteemed by some of the common people as a sovereign remedy in epilepsy. In order to get it without incurring the vengeance of these powerful guardians, dread of whom preserves it ever inviolate, by the plough, or the spade of the husbandman, a singular expedient is resorted to. A pig or a dog is tied by way of scape-goat to the stalk, and the plant is thus torn up by the root.*

The belief of the abstraction and exchange of children by fairies is, or has been, as every well-informed reader knows, by no means peculiar to Ireland; it having only a few centuries since pervaded almost the entire of Europe, furnishing a fund of amusing anecdote, or of embellishing fiction to poets, and wits. Hence the origin of the word changeling in the English language.† Pennant speaks of the superstition as still prevalent in his time, (1796), in Wales. Still more recently in many parts of Scotland the custom continued unexploded, "of watching new-born infants till the christening was over, lest they should be stolen and changed by this fantastical race," whose power for this purpose was believed to be most extensive, during the period intervening between birth and baptism. The anguish occasioned to families by such fancied theft and substitution has been well depicted by an elegant poet of Scotland, in his address to the muse of the Highlands.

Then wake (for well thou canst) that wondrous lay,
How, while around the thoughtless matrons sleep,
Soft o'er the floor the treacherous fairies creep,
And bear the smiling infant far away.
How starts the nurse, when for her lovely child,
She sees at dawn a gaping idiot stare!
O! snatch the innocent from demons wild,
And save the parents fond from fell despair.

Hibbert, in his Description of the Shetland Isles, a work published at Edinburgh in 1822, dwells on, as still in full force in these islands, the "abstraction and exchange of the human species, by unearthly dwarfs called *Trows*,"—attributing, with Sir W. Scott, the origin of the superstition to the Scandinavian mythology.

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* In allusion to the shape of the blossom, the plant was named digitalis by Fuchsius, who first noticed its medical properties, from the German name fingerhut, a finger stall or thimble. Digitalis is from digitale, the Latin for a finger-stall. "How extraordinary is it," says Sowerby in his English Botany, "that no old original English name should be known for so striking a plant. That in present use is derived from *Digitalis Fuchsii*, Fuchs, or Fuchsius having first named it digitalis. In Yorkshire it is called foxes' gloves."

† "And her base elfin breed there for thee left,
Such, men do changelings call, so changed by fairies' theft."

Spencer's Fairie Queen, the greater part of which poem was composed during his residence in this county. The word in the Irish language is "*Cluaracuane.*"

The custom of giving the *Digitalis purpurea* to children, as connected with the belief in fairies, is, so far as we are aware, peculiar to this country. In the Hebrides, Luss-more, the vernacular name by which the plant is known in Ireland is applied (Edinburgh Philosophical Journal, No xi.) to a species of crowfoot, (*Ranunculus flammula*), which is much used in these islands as an epispastic. Among the variety of monstrous charms formerly resorted to in Scotland, acccording to Sir W. Scott, to procure the restoration of the stolen child, one stated to be the most successful, causes us to shudder by its surpassing barbarity: It consisted in "roasting the suppositious infant on the live embers!" In this part of Ireland, in country places, "*to frighten*," as is alleged, "the fairy," a labourer's shovel is sometimes heated *red hot*, and brought nearly in contact with the supposed elf, who is menaced at the instant with furious oaths and gesticulations, unless he quit the house, with being thrust out of doors, on *the* "*red shovel*." In one instance which I heard of, the bugbear experiment proved fatal to the child.* I cannot help remarking, in conclusion, on the coincidence of "Pookah," the Irish name for a goblin of this class of creation, whence Puck,—a stroke as by him inflicted; and Puck, or Robin Puck, who still haunts many of the English villages, a coincidence which would seem to point to the opposite side of the channel, as the probable source from which fairy superstition was imported into this island.

A PHYSICIAN OF THE CITY.

The following is the note which was addressed to the Editor of the Lancet.

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* On the trial at the late *Nenagh* Assizes, "it appeared by the evidence, that the prisoner had repeatedly caused the sick child to be exposed at night, on a shovel on a dunghill, after administering the foxglove, and that the victim was, on one of these occasions, found dead on the dunghill."

The following distressing narrative was elicited in evidence before a coroner's inquest, held in the county Tipperary, in April 1840, (Tipperary Constitution of that date.) "A man of the name of James Mahony had a son of the age of six or seven, named John, a most delicate child. It appeared the boy had been confined to bed for two years with an affection of the spine; and being a very intelligent child, and accustomed to make the most shrewd remarks, his parents and the neighbours were led to the conclusion, that he was not the son of his reputed parents, but that he was a fairy; and therefore it was determined that the intruder from "the good people" should be frightened away, and accordingly the poor child was threatened with a red-hot shovel, and a ducking under the pump, unless he discovered who he was, and had the real John Mahony sent back. The poor child, after being held over the hot shovel, and having been taken a part of the way to the pump, told them he was a fairy, and that he would send back the real John Mahony, if they gave him that night's lodging. This occurred on Tuesday, and the child was dead the next morning."

"SIR,— A writer, who signs himself 'A Medical Student,' having, in your Number of the 15th October, commended for its successful results, the practice among the Irish peasantry of giving digitalis to epileptic children, a practice, 'originating,' he observes, " in the belief, that children so affected are *fairy smitten,*' the digitalis being given in consequence, 'as most obnoxious to the fairy tribe, and in nine cases out of ten, a cure being,' he says, 'thus effected,'—I beg leave to refer him to an article entitled 'Deleterious Practice in the South of Ireland connected with the belief in Fairies, by a Physician,' which appeared in Bolster's Quarterly Magazine, in the Number for August 1828, published in Cork. On referring to the article, it will be seen how much at variance are the facts there stated, with the salutary results ascribed to this practice by the writer, who signs himself 'A Medical Student.'—I am, SIR, with great respect, your's, &c. CAIUS."

There was no reply.

The letter of the " the Medical Student,' was written expressly, "as corroborative of the statements" of the late Dr Sharkey, senior physician to the dispensary of this city, who had, in an article which appeared in the Lancet of the previous 27th of August, asserted, from the results of his experience, the claim of the digitalis to be regarded as " a specific in the cure of epilepsy."

What good effects in the hands of the intelligent practitioner, this novel agent in the cure of epilepsy might be attended with, realizing, it may be, the sanguine anticipation of Dr Sharkey, in " conferring upon suffering human nature one of the greatest blessings that medicine can bestow," I pretend not to impugn, having not tried it in the disease; but certainly no argument in its favour (results prove quite the reverse), can be deduced from the treatment by it of children affected with epilepsy, or other diseases ascribed by the ignorant to fairies.

Silly and wretchedly superstitious, as now, to every intelligent person, appears to be the belief of the abstraction and exchange of children by fairies, it is a remarkable instance of the occasional aberration of human judgment, even in the strongest minds, that the celebrated Luther was a dupe to it.

The following is an extract from Memoirs of Luther, written by himself, translated and arranged by M. Michelet.*

" According to Luther, the devils in Germany (meaning, as we suppose, the fairies), are very fond of stealing infants from their mothers, during the first six weeks, and leaving their own ugly goblins in their place. That he is perfectly serious, no one who reads the following passage will deny. " Eight years ago I myself, when at Dessau, touched one of these changelings, which had no parents, but was the devil's brat. It was twelve years old, and was in every thing like an ordinary child. It did nothing but eat. It ate as much as four ploughmen or thrashers, and it performed the customary functions. But when any one touched it, it cried out like one possessed. If any thing unfortunate happened in the house, it rejoiced and laughed aloud; but if any thing went on prosperously, it continually moaned. I said to the Prince of Anhalt, 'Were I sovereign here, I would throw this little wretch into the Moldau, at any risk.' But the Elector of Saxony and the Prince were not of my opinion. I then advised them to pray in all the churches, that the demon might be removed. They did so during a year, when the child died. When the doctor had related this story, he was asked the reason of his advice in regard to the child, and the river. He replied, 'Because in my mind children of this description are neither more nor less than a mass of flesh without soul. The devil is very capable of such creations.' Such changelings are by the Saxons called Kilkrop. 'The atmosphere around us is filled with devils.'"*

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* See Athenæum, June 25th, 1836.

Art. V.—*On the State of the Blood and the Blood-vessels in Inflammation, ascertained by Experiments, Injections, and Observations by the Microscope. The "Astley Cooper" Prize Essay for* 1850. By T. Wharton Jones. (Guy's Hospital Reports, Second Series. Vol. vii. Part I. Pp. 1–77.)†

"Homo, Naturæ minister et interpres, tantum facit et intelligit quantum de Naturæ ordine re vel mente observaverit; nec amplius scit, aut potest."

INTRODUCTION.

What is Inflammation? The answer given to this question by empirical pathologists is, that form of disease which is characterized by the symptoms *Rubor et Tumor cum Calore et Dolore.* And the state of the affected part, whatever it may be, on which these symptoms depend, is designated by them the "proximate cause" of the inflammation.

The theoretical or rational pathologists, on the other hand, in their answer to the question, endeavour to define the state of matters on which they suppose the symptoms of redness and swelling, with heat and pain, depend.

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* See Athenæum, June 25th, 1836. From a Conversation of Luther.

† As this Memoir cannot be abridged without rendering it less intelligible than would be desirable, it is inserted entire.

The theoretical pathologists thus consider, as the disease itself, what the empirical pathologists designate the "proximate cause." When, therefore, Boerhaave taught that the "proximate cause" of inflammation is a *remora* or obstruction in the minute vessels of the affected part, caused by a *lentor* or viscidity, or by an *error loci* of the blood, he endeavoured to answer the same question as some theoretical pathologists think they answer, when they define inflammation to be a "stasis of the blood," or "an increased placticity of the blood." Again, when Stahl, Hoffmann, and Cullen, attributing the phenomena of disease to the actions of the "solidum vivum," proclaimed a "spasmus tonicus," a spasmus periphericus," a "spasm of the extreme vessels," as the proximate cause" of inflammation, they strove to solve the same proolem as that which many theoretical pathologists think they solve, when they define inflammation "as an increased action of the vessels."

We thus see that the word "inflammation has been employed in a different sense by empirical and by theoretical pathologists, without, however, any difference of opinion as to what constitutes the real question at issue. But as to the answer to this question, viz. "the state of the affected part on which the symptoms of redness and swelling, with heat and pain, depend," we see that both empirical pathologists and theoretical pathologists have differed among themselves.

At the present day, when the question, "What is inflammation?" is asked, the word is usually employed in the theoretical sense. And the answers commonly given may be reduced to two, which are directly the contrary of each other, viz.

1. Inflammation is an increased action of the vessels, with acceleration of the flow of blood in the affected part.

2. Inflammation is a diminished action of the vessels, with retardation of the flow of blood, or actual stagnation of it in the part.

Though, in both these answers, the action of the vessels is especially appealed to, it is to be observed, that the pathologists who have given the answers have not always been at one, as to what the action of the vessels really is. Very generally, though I consider erroneously, the action of the vessels has been assumed to be to assist the heart in *actually propelling the blood.* And often, the manifestations of a relaxed state of an artery have been taken for the manifestations of a state of increased action. Thus, the arteries leading to an inflamed part, pulsate more strongly, though not more frequently, than the other arteries; and this has been sometimes supposed to be a manifestation of increased action, whereas it is the contrary, being owing to relaxation of the walls of the arteries, allowing them to yield more readily to distension by the blood propelled into them at each stroke of the heart.

So also in experiments, when an artery has been laid bare, and touched with ammonia, for instance, it has been found to pulsate more strongly, and this has been put down as a manifestation of increased action of the vessel, excited by the stimulus, whereas it is a manifestation of a relaxed state of the walls of the artery. The true manifestation of increased action of an artery is *constriction.* Increased action of the arteries would thus rather retard than accelerate the flow of blood; though, on the other hand, it is to be remarked, that the advocates for a diminished action of the vessels do, some of them, consider the consequent dilatation of the vessels to be the condition on which the retardation of the flow of blood depends.

Amidst such discrepancy of opinion, it is obvious that in any attempt to elucidate the nature of inflammation, the first thing required to be done is to determine the preliminary questions, viz. 1. What the action of the vessels is, and what the manifestations of that action are? 2. What the effect of the action of the vessels is on the flow of blood? After this, the investigation of the subject, so well defined in the words forming the title of this essay, will be attended with diminished difficulty.

In the following attempt to determine "the state of the blood, and of the blood-vessels in inflammation," the plan of investigation adopted is in accordance with these views. By glancing at the table of contents, it will be seen that I have endeavoured to determine, by observations and experiments on the living frog, the animal best adapted for the purpose, first the preliminary questions above indicated, and then the state of the blood and of the blood-vessels in inflammation, as it occurs in that animal.

The knowledge thus obtained, supported by the results of such observations as may be directly made on the human body, is then cautiously applied to the elucidation of the state of the blood and of the blood-vessels, in an inflamed part in man. The determination of the state of the blood of the body generally, in inflammation in man, required no such assistance from observations and experiments on the frog.

In carrying on my investigations, I availed myself of the assistance to be derived from the study of the various authors on the subject, from Hunter down to Travers. In the composition of Chapters VIII. and IX. I have profited largely by the facts collected on the subject they treat of, in the "Handbuch der rationalem Pathologie" of Professor Henle, of Heidelberg.

CHAPTER I.—OF THE BLOOD-VESSELS OF THE WEB OF THE FROG, IN THE HEALTHY STATE.

Section I.—Distribution of the Blood-vessels.

The web of the frog's hind foot is a duplicature of skin, with blood-vessels and nerves. The arteries and veins are interposed between the two layers of skin, whilst the capillaries are chiefly distributed in their substance. There is thus a double stratum of capillaries in the web, a stratum to each layer of skin.

On each side of the toes there run a digital artery and corresponding vein. From the digital arteries the arteries of the web arise, and into the digital veins, the veins of the web open. The arteries and veins of the web do not closely accompany each; the former, in their course from the digital artery, and the latter in their course to the digital vein, occur, for the most part alternately, and at certain intervals of space. The arteries and veins, respectively, of the two sides, anastomose, the veins more freely than the arteries.

A point in the distribution of the blood vessels worthy of notice is, that the ramifications of an artery very often do not enter that part of the capillary network from which the blood is carried away by the venous radicles opening into the corresponding side of the next vein. On the contrary, the distribution is according to one or other of the two following principal plans.

1. The branch D, of artery A1, opens by its subdivisions into capillaries, which cross over the nearest vein, B3, to pour their blood into the radicles, E, E, opening into that vein on the side farthest from the artery. A modification of this plan is as follows: the capillaries pour their blood into radicles of the next vein again, as exemplified by the capillaries G, G, into which one of the subdivisions of the branch, F, of the artery A2, opens. In some cases, the arterial branch itself crosses over the vein before subdividing and opening into capillaries. In other cases, again, the venous radicle crosses to the side opposite that where it opens into its trunk, to receive its blood from the capillary network there; for example, radicle O of vein B1.

2. The arterial branches, H, I, open by their subdivisions into capillaries which cross over the parent trunk, A1, to pour their blood into the radicles K, L, opening into the vein B2, on the side next the artery. In some cases, the arterial branch itself crosses over its parent trunk before subdividing, and opening into capillaries; for example, branch M, of artery A1. In other cases, again, the venous radicle crosses over an artery to receive the blood from capillaries supplied by a branch from the farther side of the artery; for example, radicle N of vein B3.

In regard to the connection between the arterial ramifications and the capillary network on the one hand, and between the capillary network and venous radicles on the other, an important point to be observed is, that although the capillaries all communicate together, a given part of the capillary network receives its blood especially from the branches of a particular artery, and pours its blood especially into particular venous radicles.

Section II.—Structure and Endowments of the Blood-vessels.

A. *Structure and endowments of arteries.*—The walls of the arteries of the web are composed of three coats. The innermost, as seen under the microscope, is a substance of a clear and homogeneous appearance, interspersed with nuclei, and presenting a well-marked double contour. The outermost coat is longitudinally fibrous looking, and presents a double contour indeed, but the outer one is not well defined from the adjacent tissue. The outer contour of the innermost coat, and the inner contour of the outermost coat, constitute the boundaries of the optical expression of the middle coat.

The innermost coat resembles, and is in continuity with, the single coat of the capillaries, which, on its part, is in continuity with the inner coat of the veins. The outermost coat is cellular. The middle coat is muscular, and is that alone on which the variations in width, to which the arteries are subject, appear to depend.

Viewed by transmitted light, the middle coat appears clear, and presents, especially when, being in a state of contraction, it is much increased in thickness, a transversely striate appearance, indicative of the circularly disposed fibres of which it is composed.

As the arteries have contractile walls, their width is subject to vary. The average diameter of the arteries of the web, when their walls are neither unduly contracted nor unduly relaxed, may be stated in round numbers, at 1-1000th of an inch. Arteries, much dilated from relaxation of their walls, I have seen double, and even four times this width, and with the blood flowing very freely in them. This has been especially in frogs, weakened from having been kept long in confinement. The width of the arteries does not materially diminish with the giving off of branches. Just before subdividing into capillaries, the arterial branches may be wider even than the trunk.

When the arteries of the web are in a middle state, as regards width, the thickness of their wall is, on an average, 1-3600th of an inch. When the middle coat is in a state of contraction, the thickness of the wall is increased, and the width of the vessel diminished. When, on the contrary, the middle coat is in a state of relaxation, the thickness of the wall is diminished, and the width of the artery increased.

The constriction of an artery may be seen to take place to such a degree, that its calibre is, for the time, wholly obliterated. In this state, in consequence of the cessation of the flow of blood in the vessel, and the transparency of its walls, the artery may, for the time, not be readily distinguished from the adjacent tissue. Constriction may sometimes be seen to take place uniformly throughout a great extent of the course of the vessel. Sometimes the constriction is greater at intervals, so that the vessel presents a varicose appearance.

While watching the circulation under the microscope, we often see constriction of an artery take place, and, in half a minute or so, again subside; and this repeatedly. Such constrictions and dilatations, it is to be particularly observed, are not rhythmical, and are not to be confounded with the arterial pulse.

When an artery is in the act of becoming constricted, we can distinctly see the increase of thickness of the middle coat, on either side, taking place; and along with this, of course, the closing in of the innermost coat; all at the expense of the caliber of the vessel. Within the constricted channel of the artery longitudinal striæ, from corrugation of the innermost coat, may be detected. During constriction the diameter of the artery, as a whole, is somewhat diminished; the surrounding tissue being drawn in around the vessel, by the contraction of its middle coat.

I have frequently observed arteries with varicose dilatations. In some of the instances, the dilatations were only a little longer than broad, and were of an oval shape; in other instances, they implicated the vessel to a considerable extent of its length, and were of a cylindrical form. These dilatations were owing to relaxation of the walls of the artery at the part. Farther reference will be made to them below, where the flow of blood in the arteries is treated of.

Under the operation of various influences on the web, the arteries become constricted or dilated,—usually first constricted, and afterwards dilated. The constriction and dilatation, however, take place with different degrees of rapidity, and to different degrees of extent, according to the nature of the influence, thus:

1. Constriction may slowly take place, and be slowly succeeded by the normal width. This I have found to be the effect of the action of the sulphate of atropia. A solution of this substance, in the proportion of three or four grains to the ounce of water, applied to the web, causes constriction of the arteries, in about the same time that it causes dilatation of the pupil when dropped into the eye. In other words, it causes contraction of the circular fibres of the muscular coat of the arteries in about the same time that it causes contraction of the radiating fibres of the iris. As in the case of the iris, the arteries slowly recover from the action of the atropia.

2. Constriction may quickly take place, and be soon succeeded by the normal width, or a width not much exceeding the normal. This has been found to be the effect of the moderate application of cold, mechanical irritation, and galvanic irritation. When a drop of cold water is applied to the web, the arteries are seen to

become constricted, but they soon resume their previons state. Slight pressure on the web, with a blunt point, for example, in the situation of an artery, excites constriction of it, but by and by the vessel becomes dilated, as before. When the web is subjected to the influence of a single pair of plates, constriction of the arteries is induced, succeeded by dilatation, as in the preceding cases.

3. Constriction either does not take place at all, or, when it does, it very rapidly gives place to great dilatation. This is the effect of such agents as the following:—a solution of sulphate of copper (gr. xvj—℥j) with wine of opium (ʒj) dropped on the web, I have generally found to cause primary dilatation of the arteries. A strong solution of common salt I have found to have a similar effect, only, perhaps, momentary constriction has more frequently preceded the dilatation. Battley's *liquor opii sedativus* usually first excites constriction of the arteries, but dilatation quickly supervenes. A drop of spirit of wine immediately causes constriction, but this is soon followed by dilatation of the arteries.

4. Dilatation, preceded or not by momentary constriction, may slowly yield to constriction, which remains permanent. This is the effect of sulphate of copper in a concentrated solution. When a point of blue-stone is rubbed on the web, in the neighbourhood of, or over an artery, the vessel slowly but steadily becomes completely constricted, and remains so.

B. *Structure and endowments of capillaries.*—A single coat constitutes the wall of the capillaries. Viewed by transmitted light, it is optically expressed by a clear border, on either side, with a well-marked double contour, and interspersed, here and there, with nuclei, some of which are prominent towards the interior, and some towards the exterior of the vessel. The capillary coat, the thickness of which is about 1-14400th of an inch, is directly adherent to the adjacent tissue; no cellular substance intervenes, as in the case of the arteries and veins.

The average diameter of the capillaries of the web is about 1-1200th of an inch. I have not been able to observe, that the capillaries undergo any change in width attributable to contractility of their wall. I have not been able to perceive, that when capillaries are cut across, the mouths become constricted; much less their canal, as a whole. When cut across, the capillaries, for the most part, do not pour out blood; but this appears to be owing, not to any constriction of their mouths, but to the elastic and tonic closing in of the tissue around them. Variations in the state of plumpness of the surrounding parenchyma has appeared to me to influence somewhat the width of the capillaries. Accumulation of blood, by distending them, widens them somewhat.

c. *Structure and endowments of veins.*—The wall of the smaller veins is, seemingly, composed of only one coat like that of the capillaries. The wall of the larger veins is composed of two coats, and is about 1-7200th of an inch in thickness, *i. e.* half the thickness of the walls of the arteries. The inner coat is like the single coat of the capillaries and smaller veins, and also the innermost coat of the arteries. The outer coat appears to be composed of cellular substance, and is not sharply defined from the adjacent tissue.

The diameter of the venous trunks of the web is from one third to three times greater than that of the arterial trunks. The veins go on increasing in diameter from radicles to trunk in a more marked manner than the arteries.

Are the walls of the veins endowed with contractility, by virtue of which their width is made to vary? On this question I would first observe, that I have not been able to satisfy myself, that when a vein is cut across, any actual constriction of it at the place of section occurs. Blood certainly does not always, or even generally, escape from the orifices, not even the lower; but this is owing to the adjacent tissue, by virtue of its elastic and tonic reaction, closing in around the open mouths of the cut vein, as appears from the fact, that blood is sometimes seen extravasated into the tissue around the orifices, especially the lower.

Nevertheless, I think it must be admitted, that variations, though slight, in the width of veins do take place, and that by virtue of the operation of a contractile power, which we must suppose to be seated in the outer or cellular coat of their wall. The facts on which this admission is founded, are the following: first, veins may sometimes be seen with their diameter less, and their wall thicker, than similar veins usually are; secondly, in anæmic frogs, in which, from the emptiness of the vessels, dilatation cannot be attributed to distension, veins may sometimes be seen unusually wide, with their wall thin, and presenting none of those slight constrictions here and there which, under other circumstances, are presented by veins, and which are similar to, though in a very much less degree than, what are presented by arteries; thirdly, the tissue of the outer coat is one which in certain other organs manifests contractile power. Fourthly, the connection between the outer coat of veins and the adjacent tissue is, as in the case of the arteries, of such a loose nature, as to allow of a diminution of the caliber of the vessel by contraction of the wall. In the case of the capillaries, it is, as we have above seen, different.

Admitting, then, that variations in the width of veins take place by virtue of the operation of contractility of their cellular coat, it is still to be reiterated: first, that constriction or dilatation of veins cannot be observed actually taking place as it may be in the case of the arteries; secondly, that the degree of constriction or dilatation, which the veins in any case present, is very small in comparison with that which the arteries undergo.

Section III.—Nerves of the Blood-vessels.

An artery is usually accompanied by a nerve which coils round it, crossing over or under from one side of the vessel to the other at short intervals. In its course, the nerve gives off branches to accompany the branches of the artery.

Veins are not regularly accompanied by nerves, like arteries. Still nerves may be seen crossing veins, and sometimes even accompanying them, side by side, for a short distance.

Although the nerves of the web generally necessarily pervade the capillary network, they do not appear to have any special anatomical relation to the capillaries.

Arteries thus alone, of all the vessels of the web, are most constantly accompanied by nerves, and they alone of all the vessels have well-marked contractile walls.

What influence is exerted by the nerves on the contractility of the arteries which they accompany? In order to obtain an answer to this question, various experiments, such as the following, were performed.

1. *Section of the ischiatic nerve.*—After section of the ischiatic nerve, the arteries of the web generally do not lose their contractility. On the application of cold or mechanical irritation to the web, constriction of the arteries followed after a time by dilatation, took place as usual, and this continued for the ten days during which the subjects of the experiment were specially kept under notice. Arteries, when cut across, became first constricted, and by and by dilated, as usual, both above and below the section. Though the arteries thus do not lose their contractility, they nevertheless become more dilated than usual.*

2. *Section of a nerve accompanying an artery.*—It is very difficult to cut a nerve accompanying an artery of the web without injuring the artery. On the nerve being cut, constriction of the artery took place, but soon ceased. The supervening dilatation was not so great above as below the injury. Opposite the injury the artery continued somewhat constricted.

3. *Section of both the nerve and the artery which it accompanies.*—After the usual dilatation has supervened on the constriction which is the immediate effect of the section, it is found, that irritation of the web over the artery still causes constriction of it, and that both above and below the wound.

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* It may here be observed, that some days after section of the ischiatic nerve, I have found that the primitive fibrils of the nerves of the web no longer present their natural homogeneous appearance, but, as in dead nerves, their medullary contents appear broken up and granular.

CHAPTER II.—OF THE CIRCULATION OF THE BLOOD IN THE WEB OF THE FROG, IN THE HEALTHY STATE.

Section I.—Blood of the Frog.

Shortly after being drawn from the body, the blood of the frog forms a coagulum, which by and by separates into crassamentum and serum. It is scarcely necessary to repeat here, that the crassamentum consists of the coagulated fibrin of the plasma, together with the corpuscles, both red and colourless, entangled in its meshes; whilst the serum is the plasma, *minus* the fibrin which has been withdrawn from it by spontaneous coagulation.

If a drop of blood just drawn from the animal be examined under the microscope, the red corpuscles are seen aggregated together, lying flatways, and overlapping each other. A few may be observed here and there, raised up on edge, with their flat surfaces applied to each other. When a drop of blood just drawn from the animal is mixed with white of egg, and then examined, the red corpuscles are seen much more closely aggregated together, and in elongated masses. The greater agglomeration of the red corpuscles in this case is owing to the greater viscidity imparted to the plasma by the admixture of the white of egg. A similar degree of agglomeration of the red corpuscles is observed to take place in the blood of young frogs, and in the blood of frogs in autumn, independently of any admixture with white of egg,—a circumstance indicative of the existence of a greater quantity of albuminous or fibrinous matter in the blood.

In the blood of the frog under the microscope, colourless corpuscles may often be seen aggregated together in little heaps.

The red and colourless corpuscles do not evince any tendency to aggregate together.

Section II.—Phenomena of the flow of the Blood in the Vessels of the Web.

A. *In the vessels generally.*—The red and colourless corpuscles are seen, under the circumstances, by and by to be more particularly detailed, occupying different parts of the stream of blood, and moving with different degrees of velocity; viz., the red in the middle of the stream, and moving rapidly along,—the colourless, like so many small pearls, accumulated next the wall of the vessel, and rolling or sliding sluggishly along, or actually stagnant.

The accumulation of the colourless corpuscles next the walls of the vessels, and their sluggish movement just referred to, are owing to a strong tendency they have to adhere to the walls of the vessels. The actual stagnation, when it occurs, is owing to direct adhesion. This may sometimes be seen manifested in a very unequivocal manner, thus:—the corpuscle, adhering with unusual tenacity, by one small point, to the wall of the vessel, is, by the force of the stream bearing on it, elongated at the place into a peduncle. The adherent colourless corpuscle has in this case the appearance of a minute pedunculated polypus growing from the wall of the vessel. The corpuscle adhering by a greater extent of surface is not so much elongated, but is, by the force of the stream of blood bearing on it, pressed into the shape of a drop of rain on the window, when, by its weight, it is about to slide down. The same appearance presents itself when the corpuscle, although it may adhere by a small point only, does not do so with much tenacity, and therefore becomes detached, and slides along before it can be elongated into a peduncle.

When the flow of blood is active, the force of the stream is, in general, sufficient to counteract the tendency of the colourless corpuscles to adhere to the walls of the vessels. When the flow of blood is retarded, adhesion is allowed to take place, and the result is, accumulation of colourless corpuscles in great numbers. How far the tendency of the colourless corpuscles to adhere to the walls of the vessels is influenced by any change in the state of the blood, is a point which shall be examined farther on.

The red corpuscles, in the natural state, have no such tendency to adhere to the walls of the vessels as the colourless corpuscles. Their tendency to adhere to each other, and so to become agglomerated together, as seen in blood out of the body, still exists within the vessels, but the force with which the blood is propelled is, in the natural state, sufficient to prevent the operation of this tendency to any greater degree than the mere keeping of the red corpuscles together, in the middle of the stream. When any impediment, however, occurs to the free passage of the blood, then the red corpuscles may be seen to become applied to each other by their flat surfaces.

We have above seen, that the tendency of the red corpuscles to agglomerate, in blood out of the body, is increased when the plasma, whether naturally or by artificial admixture, contains a larger quantity of albuminous or fibrinous matter than usual. Farther on, we shall inquire whether an increase in the quantity of such matters in the plasma promotes the tendency of the red corpuscles to agglomerate while within the vessels, and also whether it does not give rise to a tendency to adhesion between the red corpuscles and the walls of the vessels.

In vessels in which colourless corpuscles are accumulated on the walls, the red corpuscles are seen to glide along without any interruption. There thus appears to exist no tendency to adhesion between the red and colourless corpuscles within the vessels in the natural state, any more than blood out of the body.

B. *In the arteries.*—The pulsation of the arteries of the web may be observed under the microscope. I have counted thirty-two pulsations in the minute. At each pulsation, the artery is seen to become slightly dilated, the tonicity and elasticity of its wall yielding to the blood forced into it at each stroke of the heart. If the heart be at all tortuous, or undulating, it becomes, at the same time, still more bent at the bendings. The increased bending is more readily detected than the slight dilatation. Hence, undulating arteries constitute a better subject for the observation of the arterial pulse than straight arteries.* I have noticed an artery, even when, in consequence of temporary constriction, no blood was flowing in it, bend more at the bendings at each stroke of the heart. The pulsations of an artery are observed to be less and less evident down to the capillaries. When an artery has been cut across, there is no longer any pulsation below the wound, but pulsation continues above.

In the ordinary state, the stream of blood in the trunks of the arteries is homogeneous-looking; pale red in the axis where the corpuscles are collected; colourless next the walls of the vessel where there is nothing but plasma. The homogeneous appearance of the blood in the arteries is owing to the rapidity with which the corpuscles are carried along. The tendency of the colourless corpuscles to adhere to the wall of the vessel appears to be counteracted by the force of the stream, and they are carried along mingled with the red; therefore it is that, with the exception perhaps of one here and there next the wall of the vessel, they are not individually seen any more than the red.

The terminal branches of an artery leading into capillaries, it has been above mentioned, are often considerably wider than the part of the vessel immediately before them. In this case, the blood, in accordance with the physical law, that a stream, in passing from a narrow into a wide channel, loses in velocity, flows less rapidly, on entering the dilated branches. The homogeneous appearance of the stream, therefore, ceases; colourless corpuscles are now seen in greater or less numbers, and even the red corpuscles may be individually distinguished.

Here we may stop to observe, that in the cases above referred to, in which arteries were seen in a state of great dilatation, in a circumscribed part of their extent, whilst they were elsewhere of usual width, the retardation of a stream, in passing from a narrow into a wide channel, was well exemplified, as was also its acceleration on again entering the narrow channel.

In a web, much inflamed from several wounds, there was seen varicose dilatation of three arteries. In the dilated part, the flow of blood became evidently much slower, and the blood-corpuscles were individually seen, while in the rest of the vessel they could not be distinguished, as the blood moved along so rapidly.

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* The small arteries in the conjunctiva of the human eye may be recognised by their pulsations, as manifested by increased bending.

On the side on which the ischiatic nerve had been cut, two arteries, in one of the interdigital webs, were seen in a state of dilatation, in a considerable extent of their length. In the dilated parts the flow of blood became slower, and the individual corpuscles, both red and colourless, could be distinguished, which was not the case in the non-dilated parts of the same vessels.

The arteries being capable of varying in width, as above shown, the rapidity of the flow of blood in them is subject to variation, independently of any variation in the force of the heart's action. Indeed, as an artery here may be in one state of dilatation, and an artery there in a different state of dilatation at one and the same time, we may have, with the same force of the heart's action, a rapid flow in an artery here, and a sluggish flow in an artery there. Now, as we find that the flow of blood in the arteries directly influences the flow in the capillaries and veins, it is of importance that we should particularly examine the variations in the flow of blood in the arteries, arising from variations in their width.

When the constriction of an artery, as above described, is taking place, the flow of blood is sometimes seen to become at first retrograde, sometimes at once interrupted. The retrograde movement seems to be owing to the constriction of the artery taking place from the branches towards the trunk. The vessel at last having nearly or wholly closed in, the flow ceases altogether. When the vessel begins again to dilate, single blood-corpuscles only are seen at first to pass, and that often with difficulty. Dilatation proceeding farther, more and more corpuscles pass. The artery, lastly, having attained its average width, a continuous and rapid stream is re-established.

It has now been shown that under the operation of certain agents applied to the web, the arteries become dilated. It is now to be added, that the flow of blood becomes at the same time more rapid; the resistance to its motion from friction being diminished in the dilated vessels. It may perhaps be proper to observe, that the state of general dilatation of an artery, with coincident acceleration of the flow of blood here spoken of, is not to be confounded with the state of partial dilatation above described, in which there is retardation of the flow of blood. This is a point to which we shall have occasion to return below.

c. *In the capillaries.*—The flow of blood in the capillaries is continuous, and in general slow enough to allow of the individual corpuscles of the blood, red as well as colourless, being distinctly seen. The red corpuscles pass on in single file, overlapping each other, and having their long diameter in the direction of the length of the vessel. This file or chain of red corpuscles, may be seen interrupted at intervals by the interposition of one or more colourless corpuscles, or without being interrupted, pressed aside.

When any impediment to the flow of blood from the capillaries into the veins occurs, the red corpuscles may be seen to accumulate, and to become applied to each other by their flat surfaces, with their diameters more or less nearly at right angles to the axis of the vessel.

D. *In the veins.*—In the veins the flow of blood is continuous, and more rapid than in the capillaries, but less rapid than in the arteries. When the flow is active, the stream appears red in the middle, where the red corpuscles are collected; colourless next the walls of the vessel, where colourless corpuscles, in greater or less number, are usually accumulated in the plasma. Very frequently, the flow is tardy enough to allow of not only the colourless corpuscles, but also the red, being individually distinguished.

It is in the veins, as above hinted, that we most frequently see the colourless corpuscles accumulated in such numbers as to form a stratum on the inner surface of the wall of the vessel. That this is owing merely to the less degree of force with which the blood flows in the veins, and not to any peculiar tendency to adhesion between the colourless corpuscles and the walls of the veins, may be inferred from the fact, that in arteries in which the flow of blood was sluggish, I have seen colourless corpuscles accumulated next the wall in as great numbers as may be seen in veins.

In a vein in which the flow of blood is impeded, the red corpuscles become arranged together by their flat surfaces, and are otherwise packed in all directions.

Section III.—Influence of the Arteries on the Capillary Circulation.

In observing the circulation in the web of the frog's foot, we can see distinctly that the flow of blood in the capillaries is accelerated or retarded by acceleration or retardation of the flow in the arteries. Now, we have above seen, that the heart's action being the same, the flow of blood in the arteries is accelerated or retarded according to variations in their width, which variations, on their part, are owing to the contractility of the middle coat of the arteries. The arteries are thus the great regulators of the capillary circulation, though they have no primary share in the propulsion of the blood.

In accordance with what has been above said, we may, for the sake of conveniently describing the influence of the arteries on the capillary circulation, recognise four degrees of width which may be presented by those vessels with corresponding degrees of rapidity of the flow of blood; viz.—1st degree. Artery so much constricted that there is no room for the passage of the blood-corpuscles. 2d deg. Artery just wide enough to permit the blood to flow, though with difficulty. 3d deg. Artery neither constricted nor much dilated, with the blood flowing freely. 4th deg. Artery much dilated, and the flow of blood stronger and more rapid than in the 3d degree.

In consequence of the peculiar connection above described, between the arteries and capillaries on the one hand, and the capillaries and veins on the other, we can observe the influence which a given artery especially exerts on the flow of blood in the capillaries to which it leads. Thus, when the width of an artery is reduced to the first degree by constriction, and *vis à tergo* no longer transmitted, the direct flow of blood is of course arrested in its still pervious terminal point, and in the capillaries to which it leads; but, if the constriction continue, blood is soon seen to regurgitate from the anastomosing arteries, and from the veins through the capillaries into the terminal part of the affected artery. The red corpuscles of the regurgitating and slowly moving blood aggregate together, and in some places become stagnant.* If, however, the constriction of the artery should cease, so that its width returns to the third degree, the flow of blood becoming re-established in the same degree, we see the retrograde stream in the capillaries and terminal part of the artery changed into the natural direct one, and the stagnation, when it exists, dissipated. When the width of an artery is in the second degree, the stream may continue direct, but the circulation in the capillaries of the part is sluggish; in some perhaps the blood may be stagnant.

When all the arteries of the web are more or less in the second degree of width, there is sluggish flow, with great accumulation of red corpuscles in the capillaries and veins, with here and there stagnation. In such cases, on the application of one of the agents above mentioned, the fourth degree of width of artery and rapidity of flow is produced, the consequence of which is, that the congestion and stagnation are quickly dissipated. Dilatation of the arteries, and acceleration of the flow of blood, in somewhat the same degree, I have found to be the effect of section of the ischiatic nerve.

In one case the arteries of the web were more or less constricted, the circulation sluggish, the blood in the capillaries here and there stagnant. A drop of the solution of sulphate of copper, with *vinum opii*, was applied, whereupon the arteries immediately became dilated and the circulation brisk.

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* The stagnation takes place the more rapidly when the part is kept exposed to the drying action of the air, and still more when the plasma of the blood is rich in fibrin and albumen, as it appears to be in autumn.

In another case, an artery was much constricted and varicose from the application of a solution of atropia to the web, and the blood was just flowing. A drop of Battley's *liquor opii sedativus* was applied, whereupon there took place full dilatation of the artery and a brisk flow of blood.

In the third case, the two large webs of a frog's foot were very much congested; the blood stagnant in a great many capillaries, and flowing slowly or oscillating in others. The flow in the veins sluggish. The arteries all more or less constricted. Sometimes one artery would be seen to dilate a little; and in proportion as the flow of blood in it thus became free, the circulation in the capillaries to which it led was re-established. In the second largest web, one artery was seen dilated and constricted at intervals. At two of the dilated places, red corpuscles were seen adhering to the wall of the vessel. The application, to the web, of solution of salt, was followed by uniform dilatation of the arteries, a brisk flow of blood, and the dissipation of the congestion.

CHAPTER III.—OF THE STATE OF THE BLOOD AND THE BLOOD-VESSELS IN INFLAMMATION OF THE WEB OF THE FROG, FROM AN INCISED WOUND.

When an incised wound, involving arteries, veins, capillaries, and nerves, is inflicted on the web, the part, for a moment, becomes somewhat exsanguine, but the blood soon returns. Bleeding does not, in general, take place. When it does, it soon ceases, in consequence of the corpuscles aggregating, and the fibrin coagulating at the orifices of the vessels whence blood issues.

The inflammation arising from the injury, manifests itself by redness at the margins of the wound,—the farther margin especially, or that opposite to where the trunks of the cut vessels are. Under the microscope, it is seen that this redness is owing to *accumulation of red corpuscles in the blood*, in the vessels of the part. In those vessels, especially, which have been directly implicated in the injury, the blood is perhaps seen to be stagnant, from the red corpuscles having become agglomerated together, whilst in others it is still flowing, though tardily.

Here I would stop, to explain in what sense I employ the terms "CONGESTION," and "STAGNATION." In both cases, it is to understood that there is an *unusual accumulation of red corpuscles in the blood* of the affected vessels. As long as the blood, thus loaded with red corpuscles, continues to flow, however tardily, we have "CONGESTION." When the blood has ceased to flow, in consequence of the red corpuscles having agglomerated into masses, blocking up the vessels, we have "STAGNATION."

In order to ascertain how the congestion and stagnation of the blood, occasioned by an incised wound, are brought about, a series of experiments and observations were instituted, for the purpose of determining,—in the first place, the separate effect of section of an artery on the flow of blood; in the second place, the separate effect of section of a vein; in the third place, the separate effect of section of capillaries only; and, in the fourth place, the separate effect of section of the nerve accompanying an artery.

Section I.—Effect of Section of an Artery of the Web of the Frog on the Flow of Blood in the part.

When an artery is cut across, it immediately becomes constricted, even to obliteration of its caliber, upwards in the direction of its trunk, and downwards in the direction of its ultimate ramifications. The flow of blood is thus arrested, and the immediate consequence is, an exsanguine state of the part to which the ramifications of the artery lead. But this state of matters is not of long duration. In the course of a minute or so relaxation of the wall of the artery and dilatation take place, both above and below the wound. In the upper part of the artery, the flow of blood is re-established, as far down as the first considerable branch proceeding from it above the place of section. By this branch the stream of blood passes off. In general, none of the blood, except a stray corpuscle now and then, enters the artery further, although it has become dilated down to the place of section B, where, however, the cut end of the vessel continues closed by constriction. Into the part of the artery below the section D, blood, of course, no longer enters directly. It enters, however, in a retrograde direction, and very slowly, by one set of branches, and passes out in a direct course, but still very slowly, by another set of branches. The blood which enters the artery below the section in a retrograde direction, regurgitates from the capillaries and veins to which the branches lead by which the blood enters; and, if the cut artery has a direct anastomosis below the section with another artery, blood also regurgitates by that anastomosis.

The branches by which the blood enters in a retrograde direction, and those by which it passes out in a direct course, vary according to circumstances. The following are some examples.

1. The blood regurgitates by one of the terminal branches, A, and passes off in a direct course by the other terminal branch, B. At the same time, the blood moves slowly backward in the trunk, C, and perhaps passes off in a direct course, by the lateral branch, D. The retrograde stream in the trunk may not reach up as far as the place of section, though up to that place the artery is dilated. The artery may thus be empty, or nearly so, to some extent, both above and below the place where it is cut across.

2. Instead of pursuing the course just described, the blood may enter in a retrograde direction by D, and thence in a direct course through C and A, as well as B.

3. An artery having been cut across at A, became constricted up to B and down to C. By and by, the artery became dilated, and the circulation in its upper part was re-established as far down as D; whilst in the part below the section, the flow of blood went on in a retrograde direction through E, into C, and thence in the usual direction, though slowly, into F. At G, dilatation took place, and a stream flowed in a retrograde direction through H, from its anastomosis with a neighbouring artery into the trunk at G, and in a direct course into its branch, I. By and by the blood flowed in a retrograde current in the trunk of the artery, from C to G, and thence turned with the stream into I.

4. In a case in which H had no direct anastomosis with a neighbouring artery, but in which the retrograde stream of blood came from capillaries and venous radicles, the stream from H through G into I, soon ceased, the blood having become stagnant in them.

5. In an artery which had been cut across, the flow of blood became re-established in the part below the section, in consequence of blood flowing into it by lateral branches in a retrograde direction.

What attracted notice in this case was, that in the part of the vessel A, fed by a single small lateral branch, the flow of blood was slow, whilst in the part a little lower down, fed by two large lateral branches, the flow was rapid. It was curious to observe the meeting of the slow and rapid parts of the stream.

6. Under somewhat similar circumstances we may have streams in opposite directions, meeting each other, thus: the two streams mingling and passing off by the lateral branches, A A, in a direct course.

It is to be remarked, lastly, that in one and the same case, the stream of blood may be seen at one time to run in one direction, at another time in another direction.

In the venous radicles and capillaries, through which the blood flows in a retrograde direction, into the lower part of the cut artery, congestion takes place, and eventually in most of them, stagnation also. Through a few venous radicles and capillaries, and through certain of the ultimate arterial ramifications, the backward stream may be still kept up into the artery, and thence again it may slowly flow in a direct course into other branches leading off from it. But in many of these, also, stagnation takes place. If there be an anastomosis with a neighbouring artery, the flow is so far kept up through it.

The effect of section of an artery of the web of the frog on the flow of blood in the part to which the artery leads is thus congestion and stagnation; the manifestation of which, to the naked eye, is a reddish spot.

It has been said that the re-establishment of the flow of blood in the upper part of the artery, extends only as far down as the first considerable branch, immediately above the place of section, although the artery has become dilated down to that place. The few corpuscles that enter become accumulated at one side of the vessel, and oscillate up and down. It is also said that in the artery below the section, the retrograde stream may not reach up as far as the place of section, though up to that place the artery is dilated. Eventually, however, corpuscles do enter and remain there, oscillating up and down.

As the ramifications of a given artery lead only into a particular part of the capillary network, it is the blood in that part only, and in the venous radicles leading from it, which becomes congested and stagnant, in consequence of the section of the artery; and this, because *vis à tergo* has been cut off only from the blood there. If the artery be cut without implication of any other vessel, there occurs no congestion or stagnation in the situation of the wound. The only congestion and stagnation are those of the blood in the capillaries and venous radicles, to which the ramifications of the artery lead, and the congestion and stagnation are at some distance from the wound.

The congestion and stagnation which take place in the artery below the section, and in the capillaries and venous radicles, to which it leads, is to be explained by the imperfect manner in which *vis à tergo* is communicated to the blood, in consequence of the circuitous route which it is now necessitated to follow. Except where there is an arterial anastomosis, *vis à tergo* operates entirely in a retrograde direction through the vein and capillaries from other arteries. The part of the web, where the blood is thus necessarily moving slowly, becomes the seat of exudation, and is also readily affected by the drying influence of the air, the blood thus becomes inspissated, the result of which is speedy agglomeration of the red corpuscles and stagnation. If the web be still kept stretched out and exposed to the air, it readily becomes dry in the situation of the stagnation.

Of the vessels implicated in the injury, colourless corpuscles are accumulated in greater number in those in which the blood continues to flow, than in those in which it has become stagnant.

Section II.—Effect of Section of a Vein or Veins of the Web of the Frog on the Flow of Blood in the part.

When a vein of the web is cut across, blood does not generally escape, even from the orifice below the section; I have not been able to satisfy myself, as already mentioned, that this is in any degree owing to constriction of the vessel at the place of section, much less to constriction of the vessel to any extent beyond. The non-escape of blood from the orifice of the vein, below the section, appears to me to be owing, as already stated, to the surrounding tissue, by its elastic and tonic reaction, closing in around the open mouth. That this is so appears farther from the fact, that blood is sometimes seen becoming extravasated into the tissues around the lower orifice. It is, however, to be remembered, that blood does sometimes escape from the lower orifice. On the other hand, the lower part of the cut vein may not be filled with red blood as far up as the wound. For instance, in one case, the blood in the vein below the wound was observed to be only partially loaded with red corpuscles.

After the section of a vein, there is no farther flow of blood in the upper segment from the wound up to the first considerable branch which enters the vessel. From the stream of blood which enters the venous trunk by the branch referred to, corpuscles may be seen to become detached, and attempt, as it were, to pass in the direction of the wound; but they are for the most part repelled. An oscillation, somewhat as in the case of the upper part of an artery after section thus goes on. Eventually, by the successive entrance of a few corpuscles at a time, an accumulation takes place in the part of the vein immediately above the wound.

In the vein below the section, the flow of blood becomes retrograde to another vein if there be an anastomosis with such. In a case in which a vein was cut, and also the veins with which it anastomosed, the venous radicles, and capillaries, from which they received their blood, became congested, but the flow of blood still went on in the following manner: By one set of radicles the vein received blood from capillaries in the natural direction, whilst, by another set of radicles, it sent the blood away in a retrograde direction to capillaries, from which the blood passed into the radicles of another vein. Having thus to pass through two sets of capillaries, the blood of course flowed tardily. Congestion, therefore, took place in the capillaries and venous radicles,—stagnation, however, in a few only.

As above mentioned, in the case of arteries which have been cut, the branches of a vein which has been cut, by which the blood enters in a retrograde direction, and those by which it passes out in a direct course, vary according to circumstances, even in the same vein. In a case in which the blood passed in a retrograde direction from the segment of the vein below the wound through radicles into capillaries, and from the capillaries in a direct course through radicles into the segment of the vein above the wound. In the same case, examined a short time after, the direction of the flow of blood was found to be the contrary of this; but on the application to the web of a drop of *liquor opii*, which caused dilatation of the arteries and acceleration of the flow of blood, the stream in the vein was restored to its previous direction.

In one case, in the part of the trunk of a cut vein immediately above the wound, blood entered by one small radicle and passed out by another, without mingling with the stream which entered the vein higher up.

The much less disposition to stagnation of the blood in the capillaries after section of a vein than after section of an artery is worthy of remark. In consequence of the veins anastomosing so freely with each other, the blood in any capillaries, under the influence of *vis à tergo* in the arteries leading to them, finds little difficulty in making its way into another vein, when that into which the capillaries more directly open is cut. But even when a vein is cut across which has no free anastomoses, and when the blood entering it by one set of radicles from one set of capillaries must, in order to get into a vein to be carried away, pass in a retrograde direction by another set of radicles into another set of capillaries, and thence in a direct course into the radicles of the vein which is to carry it away, the *vis à tergo* in the arteries is still in operation, and is sufficient to drive the blood onwards. After section of an artery, on the contrary, *vis à tergo* is cut off from the blood in the capillaries to which the artery leads. The only force which now bears on the blood in the capillaries in question is that transmitted in a retrograde direction from the veins into the radicles of which the capillaries open, and that transmitted by any anastomosis which the part of the artery, below the section, may have with another artery. But such force is small, and being retrograde operates disadvantageously. The consequence is, that the blood in the capillaries to which the cut artery leads readily becomes stagnant.

Section III.—Effect of Section of Capillaries only on the Flow of Blood in the part.

At a part of the web between an artery and a vein, an incision was made involving capillaries only. The artery in the neighbourhood shortly after became constricted, and the flow of blood ceased in it for some seconds; after which it dilated, and the flow went on again as before. The constriction of the artery just mentioned, it is to be particularly observed, is not the effect of section of the capillaries. It is the effect of the irritation of the web in the neighbourhood of the artery, and will equally take place when the web is irritated without capillaries being cut, and may not take place when capillaries are cut.

As an effect of section of the capillaries on the flow of blood, there took place, on the side of the wound next the artery, stagnation of blood in the capillaries actually cut as far as their communication with other capillaries. On the side of the wound next the vein, in addition to stagnation of blood in the capillaries actually cut at the immediate margin of the wound, as on the side next the artery, there took place some congestion in the capillaries generally. The capillaries, at the farther extremity of the wound, which now alone served as the channel for the blood which previously passed through the cut capillaries, became distended with blood, which, however, under the direct influence of *vis à tergo* in the artery, flowed freely through them.

After the lapse of twenty-four hours, the blood in the capillaries on the side of the wound next the vein, *i. e.*, the capillaries cut off from the influence of the force in the arteries, was found stagnant. At the immediate edge of the wound next the artery, the blood was stagnant in a few capillaries only. At the further end of the wound the flow of blood was natural.

Section IV.—Effect of Section of the Ischiatic Nerve on the Flow of Blood in the Web.

After section of the ischiatic nerve we have above seen, that the arteries are rather dilated; it is now to be added that the flow of blood is, on the whole, more rapid. The consequence of this is, that there is less disposition to congestion and stagnation from the action of such external agents as the drying action of the air, solution of salt, &c., than in the natural state.

When the ischiatic nerve has been cut, there is more disposition to congestion below the wound after section of an artery or vein. The cause of this is, that in consequence of the more rapid flow of blood in the arteries of the web generally, a greater quantity is poured into the vessel below the section. I have, however, observed, that the anastomosing vessels become enlarged more quickly, and that a free flow of blood is more quickly re-established through them.

Section V.—Effect of Section of the accompanying Nerve of an Artery on the Flow of Blood in the part.

A nerve lying close beside an artery was cut. The artery above the section became constricted as far up as the first considerable branch, and the blood ceased to flow. The artery below the section became much dilated, and there took place in it a retrograde flow of blood from the capillaries. This continued for a few minutes when the upper part of the artery having dilated, the flow of blood again took place in it, and as a consequence of this, the stream in the lower part was restored to its natural direction.

In the situation of the wound, the artery continued constricted. The artery below the wound continued more dilated than above.

In another case, the nerve alongside of an artery was cut. The artery became constricted from the place of injury upwards and downwards. The flow of blood was arrested above, up to the first considerable branch. Immediately below the wound the artery became to a short extent dilated; below that it remained constricted; but farther down it was found dilated, and there regurgitation of blood took place. After a few minutes, the flow of blood was completely re-established; but the artery opposite the wound remained narrower than above or below. Next day the blood was found flowing feely in the artery, which was still constricted opposite the wound, dilated below it.

In the third case, through a wound in the skin, a nerve was drawn out in a loop from alongside of an artery. No change in the artery occurred, except at the most a slight degree of constriction at the place where the nerve was torn away from it. The circulation went on quite vigorously throughout the whole course of the artery, and also in the capillaries into which it opened. Next day, the flow of blood in the artery was found still going on. The artery was slightly constricted at the wound. Four days after, the blood was found still flowing freely in the artery.

In the fourth case, a nerve was torn from alongside an artery, as in the preceding case, and cut through. The artery became constricted both above and below the place of injury, and the flow of blood was arrested. But in the course of a minute or two, the vessel became dilated, and the flow of blood was re-established. In the situation of the injury, the artery remained narrower than above or below. Above, it was narrower than below. On examination next day, no blood was at first seen flowing in the artery. After some minutes, however, and after a drop of water had been applied to the web, the flow commenced, slowly at first, but it soon acquired its natural velocity. The artery opposite, above and for some extent below the injured part of the nerve, was of natural width, and the blood flowed with natural velocity, but, lower down, the artery was considerably dilated, and the stream less rapid. At this latter place there was a great number of colourless corpuscles.

Section VI.—Effect of Section of Arteries, Veins, Capillaries, and Nerves altogether on the Flow of Blood in the part.

We have thus seen, that when an artery is cut across, there take place congestion and stagnation in the capillaries to which it leads; that when a vein is cut across, congestion takes place in the capillaries from which certain of the radicles of the vein below the wound arise, but stagnation only here and there; that when capillaries only are cut across, stagnation of blood takes place in those, on the side of the wound next the artery, which are implicated, only to where they are in connection with the other capillaries, whereas the stagnation is more extensive in those on the opposite side of the wound; we have seen, lastly, that when the accompanying nerve of an artery is cut, the flow of blood does not appear to be particularly influenced.

When a wound involving arteries, veins, capillaries, and nerves, is inflicted on the web, we have a combination of these effects; but perhaps to a greater degree, in consequence of the reciprocal influence of the impediments to the flow of blood in the artery and vein below the wound. And it is thus, that the congestion and stagnation are brought about which occasion the redness by which the inflammation arising from the injury is manifested.

Section VII.—Exudation in the Case of Inflammation from the Wound of the Web.

In inflammation from wound of the web, opacity of the affected part gives evidence of exudation having taken place. In the course of the healing process, we have further evidence of exudation in the thickening of the margins of the wound and in the process of granulation, the exuded matter being that which occasions the thickening, and out of which the new substance is developed.

CHAPTER IV.—OF THE STATE OF THE BLOOD AND THE BLOOD-VESSELS IN INFLAMMATION FROM THE APPLICATION OF A STRONG SOLUTION OF COMMON SALT TO THE WEB.

Section I.—Description of the Mode in which Congestion and Stagnation take place.

It has been above stated, that a solution of common salt applied to the web causes dilatation of the arteries and acceleration of the flow of blood in them, and of course in the capillaries and veins also. If the solution of salt, however, be strong, the acceleration of the circulation soon gives place to retardation from congestion and commencing stagnation of the blood corpuscles. Eventually the circulation is altogether arrested in the part, the blood having become stagnant in a greater or less number of vessels, according to the intensity and extent of the action of the salt.

Stagnation commences in the capillaries, and extends from them to the veins on the one hand and to the arteries on the other. The mode in which it is seen to take place is by red corpuscles, more collapsed and darker-looking than natural, first adhering to the walls of the vessels, and then other red corpuscles adhering to them. The first adhesion of red corpuscles to the wall of a vessel usually takes place at the bifurcation, and in this manner: The stream, striking with force on the wall of the vessel, at the bifurcation, some of the red corpuscles adhere to the wall of the vessel. Other red corpuscles adhering to them, an agglomerated mass results, which is sometimes seen to be moved along the vessel a short way by the force from behind; but more red corpuscles adhering to the mass, the vessel is at last wholly blocked up by it. The stream being no longer permitted to pass in part, passes off; but in leaving, the stream strikes on the wall of the vessel at the bifurcation, where red corpuscles adhere, and form a nucleus for an agglomeration which blocks up both the vessels, so on the process goes.

Stagnation is seen first to take place in those capillaries which are least in the direct course from the artery to the vein. In those capillaries which lead most directly from the artery to the vein, and in which, consequently, *vis à tergo* operates most advantageously, the blood is latest in stagnating. It has been supposed, that the red corpuscles first agglomerate in the arteries leading to the capillaries, and that the resulting masses, on entering the capillaries, act like plugs. To these plugs more corpuscles adhere, and thus the capillaries become entirely blocked up. It will be seen below, that grayish granulous-looking plugs, composed, apparently, of colourless corpuscles and coagulated fibrin, are sometimes seen to block up an artery; and on being forced on by the stream from behind, to block up capillaries. Such plugs, however, have no share in producing the stagnation; for this takes place in the manner above described, when no plugs are to be detected. Besides, the plugs in question continue in the capillaries only for a short time, being soon disintegrated and carried away into the veins.

The capillaries to which a given artery leads, and also the terminal branches of that artery, having become obstructed by the stagnant red corpuscles, the blood ceases to enter the part of the trunk of the artery immediately above the place where the stagnation is, but passes off by lateral branches higher up, as in the case of section of an artery. Down to the place where the blood is stagnant in the extremities of the artery, the dilated trunk contains but a small quantity of blood-corpuscles, and these are seen collected to one side of the vessel and oscillating up and down.

In the veins, the blood also becomes stagnant up to the entrance of a large branch, conveying blood from a part of the web in which the flow is still free.

Not many colourless corpuscles are seen in the vessels in which the blood is stagnant; but they are seen in considerable numbers in those veins in the neighbourhood in which the flow of blood is still free, though, perhaps, retarded.

When by adhesion to the walls of the vessel and agglomeration with each other, the red corpuscles are arrested in their course, the plasma of the blood passes on until the vessel is completely stopped up by the stagnant red corpuscles. This goes on in one vessel after another, the plasma draining away from the vessels which have become obstructed into such as still remain pervious, and with which there is communication. In some vessels, however, all the outlets from which have become blocked up with stagnant red corpuscles, plasma is retained. Such vessels appear empty, or almost so, of blood from the absence of the corpuscles.

Thus it is also, that the red injection may be seen interrupted here and there, and vessels with stagnant red corpuscles in them may appear isolated.

The stagnant red corpuscles within the vessels are so closely agglomerated together, that they present the appearance of a uniform red mass similar to that which they present out of the body when the blood is mixed with albumen.

Section II.—Explanation of the mode in which Congestion and Stagnation take place.

It has been above hinted that it has been generally asserted by authors on the subject which here engages our attention, that the flow of blood is accelerated when the arteries are constricted. and retarded when the arteries are dilated. This mistake as to matter of fact has probably arisen from observers not having accurately watched the sequence of all the phenomena. They have, for example, apparently supposed, that the retardation, which really depends on the commencing stagnation, is the effect of the co-existing dilatation of the arteries; and, in viewing the preceding acceleration of the flow of blood, they have not observed, that the arteries, so far from being constricted, are actually dilated at the time.* Observers have, perhaps, been confirmed in this view, by confounding the general dilatation of an artery with the partial dilatation above described, in which there is truly a retardation of the flow of blood; and so making an erroneous application of the physical law, that a stream loses in velocity on entering a wide from a narrow channel.

The dilatation of the arteries, and the coincident acceleration of the flow of blood, have not, when the vessels are otherwise in a natural state, any share in bringing about the subsequent stagnation. This is proved by the fact, that in frogs, we may sometimes observe the arteries very much dilated and the blood flowing freely, without any tendency to stagnation; whilst, on the contrary, there is a tendency to stagnation in the capillaries when the arteries are constricted. The same thing can be more strikingly demonstrated by experiment. We have above seen that after section of the ischiatic nerve, the arteries of the web of the same side are found somewhat more dilated, and the flow of blood in them freer and more rapid than in the web of the uninjured side. If, after section of the ischiatic nerve, we apply the solution of salt to the webs of the same side, it is found that stagnation of blood in the vessels does not so readily take place as it does when we apply the same solution to the webs of the uninjured side, or to the webs of a frog which has not been injured at all. In short, *stagnation is not so readily induced by the salt when the ischiatic nerve is cut as when it is entire;*[*] and this is no doubt owing to the greater dilatation of the arteries, and the consequent freer and more rapid flow of blood.[†]

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* On the very first application of the salt to the web, there is sometimes a momentary retardation. This is coincident with the constriction of the arteries, Dilatation of the arteries and acceleration of the flow of blood quickly supervene.

CASE.—The ischiatic nerve of a frog cut, and then the webs of the same side examined. The arteries were seen to be dilated, and the flow of blood in them free and rapid. A drop of a solution of salt applied to the webs, but stagnation did not take place. Another drop applied, and stagnation took place at the most depending part where the drop lay longest. Elsewhere the circulation continued free. In some places, near where the solution of salt lay longest, there was congestion without stagnation. The webs of the side on which the ischiatic nerve was still entire were next examined. The arteries were rather constricted, and the circulation was not so free. A drop of the solution of salt applied, whereupon stagnation took place very quickly.

It appears to me, that the adhesion of the red corpuscles to the walls of the vessels, and to each other, on which the stagnation depends, can be attributed only to a change in the state of the blood itself, produced by the action of the salt—a change consisting in inspissation of the plasma, as regards its albuminous and fibrinous constituents. On this condition of the blood we have seen that the more ready agglomeration of the red corpuscles in blood out of the body depends. The mode in which the salt acts in producing inspissation of the plasma, I consider to be principally by withdrawing water from the blood by endosmose.

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[*] It has been stated by Dr Krimer, that the application of salt to the web of the frog does not cause inflammation when the ischiatic nerve has been cut; but the accuracy of this has been callled in question by Prof. H. Nasse. From what is said in the text, it will be seen that Dr Krimer's statement, although not accurate, was not altogether without some foundation.

[†] After the experiments recorded above, on the effect of section of the nerves accompanying arteries, and of the ischiatic nerve, I am no longer of opinion, as I formerly was, (Brit. and For. Med. Rev., April 1844,) that stagnation is in any direct manner owing to suspension of nervous influence on the arteries.

The change in the appearance of the agglomerating corpuscles above noticed, of itself indicates a change in the composition of the plasma.

That inspissation of the plasma is the cause of the adhesion of the red corpuscles to the walls of the vessels, and to each other, on which the stagnation depends, is an opinion which has been already expressed by my much esteemed friend, Professor Henle, of Heidelberg; but his opinion as to the mode in which the inspissation is produced is different from that above stated. The Professor's opinion is this: As a physical consequence of dilatation of the vessels, there takes place a retarded flow of blood. This retarded flow, together with thinning of the walls of the vessels, arising from relaxation and dilatation, favours the exudation of serum, the consequence of which is that the plasma becomes inspissated by a preponderance of protein matter over the salts. This view of the matter does not appear to be in accordance with the facts which we have above had occasion to relate: thus,—1st, There is an accelerated, and not a retarded, flow of blood, as a consequence of dilatation of the arteries. 2d, That, supposing thinning of the walls of arteries from relaxation and dilatation do favour exudation of serum, such exudation can contribute nothing to the stagnation, as is evident from the cases above referred to, in which there is relaxation and dilatation of the arteries, without any tendency to stagnation. But it is principally through the walls of the capillaries that exudation takes place; and these walls neither become contracted and thickened, nor relaxed and thinned, so that they are always equally ready to allow of exudation, provided the necessary condition exists, viz., congestion and stagnation. 3d, Retardation of the flow of blood is the effect of congestion of red corpuscles in the vessels, and commencing stagnation, which, on their part, are the effect of the abstraction of water from the blood by the endosmotic action of the salt. Hence retardation of the flow of blood can have no share in producing the inspissation which causes the stagnation.

Against the opinion, that inspissation of the plasma is the cause of the adhesion of the red corpuscles to the walls of the vessels, and to each other, on which the stagnation produced by the action of the salt on the frog's web immediately depends, it might be contended, that a given portion of blood in the capillaries exposed to the endosmotic action of the solution of salt will have passed on into the veins, and been succeeded by another portion, before inspissation can have taken place to the requisite degree, and so on. In reply, it is to be observed, that this is no doubt the case: when the solution of salt is weak, or when the salt is applied to the sole of the web, where the epidermis is denser, and less permeable, or when, as above seen, the arteries are dilated, and the flow of blood free and rapid; and is the cause why, under such circumstances, stagnation does not so readily take place. When, however, the solution of salt is strong, and is applied to the dorsum of the web, where the greater fineness of the epidermis more readily allows of endosmose, or when the flow of blood is not unusually free and rapid, we can easily conceive how, from the small quantity of blood exposed to the endosmotic action of the salt, water should be rapidly enough abstracted, and the plasma thereby at once inspissated to a degree sufficient to produce the effect which, under the circumstances named, we observe to take place so readily, viz. adhesion of the red corpuscles to the walls of the vessels, and to each other, and consequent stagnation.

That stagnation is more readily occasioned by the application of salt, the slower and less free the flow of blood is, is well shown in the vessels to which the lower part of an artery, that has been cut across, leads; also in the vessels around a wound in which the flow of blood is sluggish; also, when the trunk of a vein has been cut across, in the part of the vessel below the section and its radicles. In vessels, under such circumstances, we have above seen, that stagnation may spontaneously take place; if not, it is very rapidly induced by the application of the solution of salt.

From the account now given of the mode in which congestion and stagnation of the blood are occasioned by the application of a solution of salt to the web of the frog, it is evident, that the colourless corpuscles contribute nothing to the effect. Sometimes, however, we see an artery become blocked up by a mass composed apparently of colourless corpuscles and fibrin. In a web, in the vessels of which stagnation of the blood had been produced by the action of salt, an artery in which the blood had continued to flow freely, suddenly became stopped up by a plug of a gray granulous substance, so that the blood was arrested in its course, and passed off by the first considerable branch above the obstruction. Into the artery below the obstruction, the blood flowed in a retrograde direction by one set of branches, and passed out in a direct course by another set of branches, as in the case of section of an artery. By-and-by the plug was pushed along in the artery by the force from behind, and the flow of blood was re-established down to the first considerable branch above the place, where the plug again stopped. A portion of the plug of granulous substance becoming detached and carried away, the mass was reduced in size, so that it admitted of being again forced on. It next caused obstruction in a capillary; but while it was in the act of being broken up and carried away in the stream in fragments, the struggles of the animal interrupted the observation. In another case, one in which a large portion of the web had sloughed away from inflammation, excited two or three days before, I several times saw, while watching the flow of blood in the remaining part of the web, capillaries suddenly become filled with a gray granulous-looking substance. This, for a time, obstructed the vessel; but it was always at last moved on by *vis à tergo*, and getting into a vein was carried away. In other cases, I have seen similar masses adhering to the wall of the vessel, but not entirely stopping it up. In some cases, I have been able to satisfy myself, that the plugs of gray granulous substance consisted of colourless corpuscles, agglomerated and held together by a tenacious-looking matter, probably coagulated fibrin. In other cases, it appeared to me, that the gray substance consisted of minute granules, held together by the tenacious matter.*

Section III.—Exudation in the Case of Inflammation from the Application of a Strong Solution of Salt to the Web.

In inflammation from the action of a strong solution of salt on the web, exudation is manifested by opacity and thickening, and, in a greater degree, by a collection of fluid between the two layers of skin. In a web to which a strong solution of salt had been applied three days before, and in which congestion and stagnation had been produced, the circulation was found re-established in great part, except at the free margin of the two largest webs, where there were collections of fluid between the layers of skin, giving rise to the appearance of blisters. The fluid contained in these blisters having been evacuated and placed under the microscope, was found to present elementary granules, nuclei surrounded by an amorphous substance, and completely formed nucleated cells. The latter were very pale, finely granular, and about 1-1800th or 1-1600th of an inch in diameter.

CHAPTER V.—OF THE STATE OF THE BLOOD AND THE BLOOD-VESSELS OF A PART OF THE WEB OF A FROG, CAUTERIZED WITH BLUE STONE.

When a point of blue stone is rubbed on the web over an artery, this vessel, after, perhaps, being momentarily dilated, and having the flow of blood in it accelerated, is seen to become slowly but steadily constricted to obliteration. The blood thus ceases to enter the artery below the cauterized place in a direct course. It passes off by the first considerable branch above, but into the artery below, the blood enters in a retrograde stream by regurgitation, exactly in the manner already described, in the case of section of an artery.

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* I have found, that on pressing the web over an artery or vein—a large vein especially—pretty firmly with a blunt point, an agglomeration of colourless corpuscles with a few red ones, held together, apparently, by coagulated fibrin, occurs, adheres to the wall of the vessel, and more or less completely obstructs it at the place. Young healthy frogs are the best subjects for the experiment.

When a point of blue stone is rubbed over capillaries, the blood ceases to enter them.

When the blue stone is rubbed over a vein, the blood in it becomes stagnant and altered in appearance.

When blue stone is rubbed over a considerable extent of web, so that arteries, capillaries, and veins, are all acted on by it, we have a combination of all the above-mentioned effects.

In the uncauterized part of the web, which borders on the cauterized part, we have congestion and stagnation of blood in the vessels, such as would have been produced, if, instead of cauterizing, we had cut out the portion of web.

CHAPTER VI.—OF THE STATE OF THE BLOOD AND THE BLOOD-VESSELS DURING THE HEALING PROCESS, AS OBSERVED IN THE WEB OF THE FROG.

Section I.—Of the State of the Blood and the Blood-vessels during the Healing of a Wound of the Web.

A. *When an artery only is cut across.*

In a day or two after the injury, sooner or later, according to circumstances, the flow of blood usually becomes re-established in the vessels in which there may have been stagnation, but it goes on more or less sluggishly.

In two cases, the cut-ends of the artery became re-united, and the flow of blood was restored in it as before.

When the wound of the web is small, it becomes filled up with a grayish substance, composed of cells with granular contents. In this substance, by which the wound may be closed in two or three days, no circulation is at first seen; but in the course of a fortnight or three weeks, blood corpuscles may sometimes be observed obscurely threading their way in a channel or channels in the opaque newly-formed substance.

When the wound of the web is large, immediate union does not take place. The edges of the wound become thickened, and the capillaries, all round, but especially those on the further side, much congested and enlarged. The newly-formed substance, which is composed of cells in process of being metamorphosed into cellular tissue, appears at the edge of the wound in the form of a clear border of fibrous-looking tissue, without blood-vessels. In this substance, however, capillaries appear to be by-and-by developed in connection with the surrounding old ones; but before this is accomplished, more new substance has been added at the edges, so that they still continue to present a clear non-vascular border. The capillary net-work around the wound receives its blood from the branches of the artery above, and, in a retrograde direction, from the artery below.

This process goes on until the granulating edges meet, when the non-vascular substance coalesces, and the wound is closed. The appearance which the part now presents is a gray non-vascular spot in the middle, and a vascular network around.*

The artery above the wound becomes obliterated up to the first considerable branch which now constitutes the continuation of the trunk of the artery. The artery below the wound becomes obliterated down to the first considerable branch. In general, blood flows into it from an anastomosing branch of a neighbouring artery. The lower part of the cut artery thus virtually becomes a continuation of the anastomosing artery. The blood supplied by the latter flows from the former, through its branches in a direct course. When the artery below the wound has no anastomosis with another artery, it shrinks, and comes to form part of the capillary network.†

B. *When capillaries only are cut across.*

The capillaries actually cut, shrink, and disappear, whilst those with which they communicated become somewhat enlarged, and form a marginal network around the wound.

C. *When a vein only is cut across.*

As in the case of section of an artery, the wound of the web, when small, may become closed, in the course of two or three days, by a grayish granular substance interspersed with pigment granules. By-and-by, in channels in this new substance, blood-corpuscles may be observed threading their way, though obscurely on account of the opacity of the new substance.

When the wound of the web is larger, immediate union does not take place: but the process analogous to granulation above described in the case of section of an artery, is established at its edges.

The vein becomes obliterated up to the first considerable radicle above the wound, and down to the first considerable radicle below. Usually the capillary anastomosis between the two radicles referred to becomes enlarged, and constitutes a new channel for the passage of the blood from the vein below to the vein above the wound.

D. *When arteries, capillaries, and veins are cut across.*

In this case, the wound is necessarily of considerable size. Immediate union, therefore, does not take place.

Around wounds inflicted about a week before, inflammatory redness was visible to the naked eye. Under the microscope, it was observed, that the capillaries in the red parts around the wounds were gorged with red corpuscles, and that the blood was for the most part flowing, but more or less luggishly. No new vessels were as yet formed. The blood, however, flowed in a retrograde direction in certain of the old vessels. The particular connection of the capillaries around the wound, with the nearest branches of the cut arteries and veins, both above and below the wounds, will be understood from what has been already said.

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* See Travers On the Physiology of Inflammation and the Healing Process, p. 168.

† Varieties in the direction of the flow of blood are, of course, to be observed depending on the varieties above described.

I have sometimes found the lower part of the cut artery tortuous and dilated at intervals.

At the extreme margins of the wound, the process of granulation, including the development of new capillaries, goes on in the manner above described under the head, A. The new capillaries constitute the terminal loops of the network margining the wound. In these terminal loops the blood is stagnant; but in the rest of the network, the blood, loaded with red corpuscles, is seen flowing, though more or less sluggishly.

The edges of the wound where the granulating process is going on, are thick from exudation into the substance of the web, and become drawn together so much, that if the wound is not too large, they at last meet and unite. After this, many of the capillaries shrink and disappear, and the circulation becomes freer in the remainder. The cicatrix continues thick for a while, and the web is puckered around it. If the wound be large it does not close, but its edges cicatrize.

The cut arteries and veins become obliterated in the manner above described under the heads A and C, as far as their nearest considerable branches, and in the course of the process extravasated blood disappears.

Though the flow of blood has become freer, red corpuscles are sometimes seen adherent here and there to the sides of the vessels; and, what is worthy of note, most of the red corpuscles are distended, and of a round form.

Section II.—State of the Blood and the Blood-vessels during the process of Resolution of Inflammation of the Frog's Web, excited by the application of a strong Solution of Salt.

Stagnation of the blood occasioned by the application of a strong solution of salt to the web, when not to a very great degree, becomes quickly dissipated, especially in vigorous frogs. The flow of blood is observed to be re-established in the following manner: the agglomerated mass of red corpuscles in a given vessel, exposed to the force from behind in the artery leading to that vessel, is seen to oscillate, yielding a little at each stroke of the heart, and again recoiling. If the vessel in question has an outlet into another in which the flow of blood is free, it is seen that the agglomerated mass of red corpuscles, being at last moved onwards, protrudes into the free vessel, the stream in which detaches and carries away the corpuscles composing the protruding part. In this manner successive portions of the agglomerated mass are carried away, until at last, reduced to a small size, it is all driven onward by the stream from behind into the stream in front, where it is broken up into its constituent corpuscles. The blood has now free course in the obstructed vessel. In this way one vessel after another is cleared until the circulation is fully re-established in the web.

The process just described may be promoted by applying to the web any of the agents above mentioned, as possessing the property of causing dilatation of the arteries and acceleration of the flow of blood,—*even a solution of salt.* It is to be remembered, however, that the solution of salt, for instance, if strong, may exert its property of causing dilatation of the arteries with acceleration of the flow of blood in vain, in consequence of its tending to keep up the stagnation by virtue of its other property of abstracting water from the blood by endosmose, and thus inspissating the plasma.

The re-establishment of the flow of blood, in the manner described, is to be attributed to the force from behind operating on the agglomerated mass of red corpuscles, now become loosened by having imbibed the thinner plasma of the blood flowing against it. The promotion of the process, by the applications referred to, is an interesting illustration of the *modus operandi* of stimulating collyria, applied to the eye, for the cure of inflammation of the conjunctiva.

Section III.—State of the Blood and the Blood-vessels, when Resolution of the Inflammation of the Frog's Web, excited by the Application of a strong Solution of Salt, does not take place.

When the action of the salt on the web is kept up for some minutes, the stagnation of blood is rendered so complete, that resolution does not take place, especially towards the free margin of the web. The web at this place becomes thickened and opaque from exudation. When the salt is allowed to act still more intensely, the effects described in the following section are observed.

Section IV.—State of the Blood and the Blood-vessels, when Resolution of the Inflammation of the Frog's Web, excited by the Application of a strong Solution of Salt, does not take place, but when a part of the Web mortifies.

In a part of the web, which has mortified, there is no longer any appearance of blood and blood-vessels. Next the mortified part, the web is red from vascular injection. Under microscopical examination, the blood is seen to be completely stagnant in some of the injected vessels, oscillating in others. In the situation of the vascular injection, the web is very opaque, and this prevents the exact connections between the different vessels being well seen. But it may be observed, that the blood-vessels in the web are in the same condition as when a piece is cut away, instead of being destroyed by mortification. In the arteries leading towards the mortified part, blood flows as far only as to the first considerable branches above. By these the stream passes off, and from them the capillaries and veins, bordering on the slough, into which blood may still enter, receive the blood.

In the part of the web bordering on the slough, there are spots of extravasated blood. In a case in which the web, at the free edge, had mortified, there was seen, at the boundary between the living and dead parts, the reverted edge of one of the layers of skin, which had become torn at the place when the evacuation of the fluid accumulated between the two layers occurred. Here large veins filled with stagnant blood were exposed. During examination these vessels were seen to give way, and the blood to be effused. At a subsequent examination, I easily detached the slough with a needle under the microscope, and in doing so, observed the softened state of the affected tissues.

A slough of the web having separated, the network of vessels at the margin of the living part eventually comes to present all the characters of a capillary network. The larger vessels which have been truncated by the mortification, become obliterated as far up as their connection with some considerable branch above, which now comes to represent the continuation of the artery, or principal radical of the vein, as the case may be. As this goes on, the blood contained in the vessels, which become obliterated, disappears, being extravasated and absorbed.

During the process of granulation and cicatrization at the edge of the web, and which in this case constitutes the healing process, the blood in the vessels of the extreme edge of the capillary network is found to continue stagnant.

As to the state of the blood, and the blood-vessels generally, of a web inflamed in the degree above described: The arteries and veins are dilated. The veins very much dilated, and their walls sometimes no longer distinguishable. On the sides of such dilated venous channels, numerous colourless corpuscles may be seen accumulated whilst the blood is flowing freely in the middle. In vessels in which, in the progress of the healing process, the flow of blood has become re-established, numbers of blood corpuscles, red as well as colourless, continue to adhere to the walls.

In a case in which the second web had sloughed away to a small piece, stagnation of blood still existed at the edge of that piece; but higher up, a free flow of blood had now superseded stagnation. Here the walls of many of the vessels can no longer be distinguished, and the blood appears to be flowing in mere passages, hollowed out in the substance of the web. All along the sides of the passages, numerous blood corpuscles are adherent. The adherent corpuscles are most of them *red*, but most of these red ones, again, are *round*. It may therefore be asked, Are the corpuscles in question colourless corpuscles in the course of becoming red ones, or are they red corpuscles which have lost their oval shape in consequence of the action of the plasma in an altered state? In vessels, in which stagnation had not continued so long, colourless corpuscles were seen in greater number, but not much greater. In the portion of web under notice, spots of extravasated blood were seen here and there.

CHAPTER VII.—AN ATTEMPT TO APPLY WHAT WE HAVE LEARNED FROM OBSERVATIONS AND EXPERIMENTS ON THE FROG, RESPECTING THE STATE OE THE BLOOD AND THE BLOOD-VESSELS IN AN INFLAMED PART, TO THE ELUCIDATION OF THE STATE OF THE BLOOD AND THE BLOOD-VESSELS IN AN INFLAMED PART IN MAN.

Section I.—Of the State of the Blood and the Blood-vessels in Inflammation in Man.

So far as we can judge from observation with a magnifying glass, of the distribution of the blood-vessels of the human conjunctiva, when it is inflamed, and from the examination with the miscroscope of injected preparations of other parts of the human body, the plan of distribution of the smallest arteries, of the capillaries, and of the smallest veins in man, appears to be essentially similar to the plan of distribution, which has been above traced in the web of the frog.

The structure of the smallest arteries, of the capillaries, and of the smallest veins of the human body, appears to be, from anatomical examination, the same as the structure of the corresponding vessels of the frog. From this, and from what we know of the endowments of the larger vessels in man, and the mammifera,* we may fairly conclude that the endowments of the smaller vessels in man are likewise the same as the endowments of the smaller vessels in the frog,—that, *e. g.*, the walls of the smallest arteries in man are contractile, as they are seen to be in the frog.

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* Verschuir, de Arteriarum et Venarum vi irritabili.—Hunter, on the Blood, Inflammation, &c.—Fowler, Tentamen medicum inaugurale quædam de Inflammatione complectens.—Jones, on the Suppression of Hemorrhage from Divided and Punctured Arteries.—Hastings, on Inflammation, &c.

We are well acquainted with the blood of man out of the body, and with the differences and resemblances between it and the blood of the frog. We are fairly warranted, therefore, in inferring, from what we observe of the comportment of the blood of the frog within the vessels, and the phenomena of the circulation, much as to the comportment of the blood of man within the vessels, and the phenomena of this circulation. The inference that there is, in all essential respects, a similarity, is confirmed by what may be observed of the circulation in the wing of the bat, and in the mesentery of the mouse. The pulsation of the small arteries of the conjunctiva in man, as manifested by increased bending, we can recognise with a magnifying glass to be the same as in the frog.

The vascular injection of the inflamed conjunctiva in man, as observed with the naked eye, or by means of a magnifying glass, presents the same characters as the vascular injection in inflammation of the web of the frog, as observed by the same means. For this reason, and seeing that the plan of the distribution of the smallest vessels in man appears to be similar to that of the distribution of the smallest vessels in the frog; moreover, knowing that the red corpuscles of the blood of man agglomerate together much more readily than those of the blood of the frog, we may fairly conclude that, in the vessels of an inflamed part in man, the red corpuscles of the blood are accumulated and aggregated together in a similar manner, though to a greater degree, to what we can directly observe in the frog. Indeed, if we were to judge from the comparative examination of detached parts of the human body, and of the frog in a state of inflammation, after death, we should expressly affirm the proposition.

That the vascular injection of traumatic inflammation in man takes place by the same process as in the frog, may also be concluded. Why inflammatory injection occurs more readily, and in a more marked manner in man than in the frog, by the same process, is explicable by all that we know of the blood and of the blood-vessels in man. Thus, as the number of vessels implicated in an incised wound of the skin in man is greater than in the frog, so there is a greater number in which *vis à tergo* is interrupted, and from which a ready exit for the blood is cut off. But besides this, in consequence of the greater tendency of the red corpuscles of human blood to aggregate, stagnation will take place more readily in the implicated vessels, so that there will be more extensive injection of the part than the greater number of vessels implicated would alone determine.

We have equal reason to conclude, that it is by the same process as in the frog that inflammatory injection takes place in man from the application of chemical irritants.

In elucidation of the process, however, by which inflammatory injection takes place in man, from the operation of cold, we do not derive so much assistance from observations and experiments on the frog. Still we may infer something as to the mode in which inflammation is excited in a part of the human body by the direct action of cold on it; and thence form a conjecture, at least, as to the mode in which inflammation of internal organs is excited by exposure of the body to cold and wet.

We have seen, that the effect of the direct action of cold on the small arteries of a part, is vital contraction of their walls and constriction of their calibre, and we have also seen, that when all the arteries of a part are more or less constricted, there is sluggish flow of blood, with great accumulation of red corpuscles in the capillaries and veins, and here and there stagnation. A similar state of the blood and the blood-vessels to that here mentioned, is the only possible one which we can conceive as the first step to inflammation of a part of the human body from the direct action of cold on it. The bluish redness of the affected part, indicates great accumulation of blood in the venous radicles,—a state which, under the circumstances, can be owing only to constriction of the small arteries, whereby *vis à tergo* is diminished, and blood thus allowed to regurgitate into, and accumulate in, the small veins and capillaries.

Dilatation of the small arteries we cannot conceive to be, in the case under consideration, or, indeed, in any other, the first step to inflammatory congestion. Supposing that the constriction of the small arteries has given place to dilatation, as might be, even under the continued operation of the cold, we have seen that the effect of the dilatation could only be *acceleration of the flow of blood.* Hence, although the part might be redder than natural, it would not be so red as in inflammation, and certainly not bluish red, seeing that there would be no accumulation of blood in the venous radicles.

So far, then, from being the first step to the inflammation of a part excited by the direct action of cold, dilatation of the small arteries must be viewed as the first step to reaction and resolution.

As to that state of the blood and the blood-vessels which constitutes the first step to the inflammation of a part of the human body, excited by the exposure of some other part to cold and wet: Here, again, we cannot conceive any other condition in operation than constriction of the small arteries, and the consequent sluggish flow in them, with accumulation of red copuscles, in the capillaries and venous radicles. This being so, the question arises: How is the constriction of the small arteries called forth? It is generally agreed, that the organ which becomes affected is *the weak organ* of the body at the time. In that organ we consider, that the small arteries are more irritable than in the other organs, and are, therefore, more readily excited by contraction by the impression communicated to them, in common with the other organs, through the nervous system.

In opposition to what is said in this and the preceding page, as to constriction of the small arteries being the first step in the inflammatory process, excited by the action of cold; it may be argued, that the arteries leading to an inflamed part are much relaxed. I not only admit that they are so, but also that the small arteries are relaxed in an *established* inflammation. In short, that the small arteries are in the same state as that in which we see them in inflammation of the web excited by the application of salt. It is only in the commencement that I consider constriction of the small arteries exists.

When relaxation and dilatation of the arteries take place, the acceleration of the flow of blood in them may overcome the congestion and stagnation in the capillaries and venous radicles; in which case there will be resolution of the inflammation. But this failing to be accomplished, the dilatation of the arteries will lead to aggravation of the inflammation, by allowing a greater quantity of blood to be poured into the vessels of the affected part than can escape, in consequence of the pre-existing obstruction from stagnation. This can be directly observed, in inflammation of the web of the frog from a wound.

How does a particle of sand, for instance, in the eye, excite inflammation? In this case, there is neither solution of continuity of the vessels, nor previous abstraction of water from the blood by endosmose, causing inspissation, to account for the accumulation of blood in the small vessels. We have seen, that when the web of the frog is irritated by pressure in the situation of an artery, constriction of the vessel takes place. A similar effect, I am disposed to believe, is produced on the small arteries of the conjunctiva, by the irritation of the foreign particle. Whether the irritation directly affects the nerves of the arteries, or operates on them by reflex action through the sensitive nerves of the conjunctiva, is a question. The former alternative (supposing the view of constriction of the small arteries being the first step to the inflammatory injection, in the case in question, to be correct), is favoured by the case, reported by Sir Charles Bell, of a patient whose conjunctiva was so insensible, that touching it caused no winking, though it excited injection of its vessels. And this case is in accordance with what we have seen in the frog, viz., that after section of the ischiatic nerve, which includes the sensitive fibrils of the web, constriction of the arteries, followed after a time by dilatation, may still take place on the application of cold, or mechanical irritation to the web.

It is scarcely necessary to say, that caustic applied to a part of the human body arrests the circulation in it, and excites inflammation around it, by a process similar to that above described in the case of the frog.

From what has now been said, we may admit the following summary of the state of the blood in the vessels of an inflamed part in the frog, as applicable to the state of the blood in the vessels of an inflamed part in man. The summary is here given for the sake of comparison with what is to be said, in the next chapter, of the state of the blood of the body generally in inflammation in man.

In the vessels of an inflamed part, the quantity of red corpuscles of the blood is augmented, and that of the plasma is diminished. That the plasma is inspissated, as regards its fibrinous constituent, may be inferred from the circumstance, that the red corpuscles are agglomerated together, in a manner similar to that in which we see them in blood out of the body when the plasma is so inspissated. Another ground for inferring that the plasma is inspissated is, that the agglomeration of the red corpuscles takes place under circumstances, when it is known that water has been abstracted from the blood in the affected part.

The increase in the quantity of red corpuscles in the vessels of an inflamed part, and the diminution in the quantity of plasma, are owing to the red corpuscles being retained in the vessels in the manner already explained, while the plasma passes on. The inspissation of the plasma, which is owing to the abstraction of water from the blood in the part, by the means immediately again to be referred to, may be quite independent of any inspissation of the plasma of the blood of the body generally, as will be more fully considered below.

Local inspissation of the plasma of the blood with its consequences, congestion and stagnation of the red corpuscles, we have seen to be readily produced in the frog's web, by the application of a strong solution of common salt, which abstracts water from the blood by endosmose. Local inspissation of the plasma, again, we have seen to be produced in the following manner:—in consequence of a wound there is an impediment to the flow of blood in the vessels implicated; accumulation of blood, therefore, takes place in them; and, in consequence of this accumulation, serum is exuded more copiously than under ordinary circumstances. In a case in which, in consequence of a wound, there is an impediment to the flow of blood in the vessels implicated, if a solution of salt be applied to the place, inspissation of the plasma is more rapidly and effectually produced, and hence the great readiness with which, as above shown, stagnation takes place under such circumstances. Again, in a case in which, in consequence of a wound, there is an impediment to the flow of blood in the vessels implicated, exposure of the part to a drying air causes local inspissation, and so promotes stagnation.

We have seen that in the vessels of an inflamed part colourless corpuscles are accumulated in great quantity. This increase in the quantity of colourless corpuscles, it is to be observed, is more marked in vessels in which the blood is still flowing than in those in which it is stagnant. In the vessels in which the blood is stagnant, indeed, the quantity of *red* corpuscles, as compared with that of the colourless corpuscles, exceeds the normal proportion. The cause of the increased accumulation appears to be simply that the colourless corpuscles are more disposed to adhere to the walls of the vessels, and this is probably owing to the retardation of the flow of blood and to the inspissation of the plasma.

Floccules of a grayish granulous substance have been above described as being sometimes seen blocking up a vessel of the inflamed part, but usually for a short time only, being eventually broken up and carried onward by the stream of blood. Similar floccules, it has also been above mentioned, may be readily produced, especially in young frogs, by pressing with a blunt point over one of the vessels of the web. The floccules, in this case, appear to be a deposition of coagulated fibrin from the blood containing entangled principally colourless corpuscles, but also some red ones. The deposition occurs on the inner surface of the wall of the vessel at the place injured by the pressure. The floccules are gradually detached in fragments and carried away in the stream of blood.

The phenomena of inflammation, when it is seated in an external part of some size, as the hand and forearm, for example, have been referred to as showing, that an increased quantity of blood enters the inflamed part and circulates through it. And in corroboration of the view, Mr. Lawrence relates a case of inflamed hand and forearm requiring general depletion, in which a vein in each arm was opened at the same moment. Three times more blood flowed from the vein of the inflamed limb than from that of the sound one, in the same time. The phenomena referred to, and this important fact, however, do not warrant the inference, that there cannot be stagnation of blood in the vessels of the inflamed part. The part which is the actual seat of the inflammation is to be distinguished from the surrounding parts of the affected organ. It is into and in the latter that a greater quantity of blood enters and circulates, and this because the arteries leading to and distributed in them, are relaxed and dilated, without being otherwise affected.

Section II.—Exudation in Inflammation of a part of the Human Body.

From our observations and experiments on the frog, we have seen that exudation does not precede but follows congestion and stagnation. The exudation of fluid between the two layers of skin of the web, in the cases above described, of inflammation excited by the prolonged action of a saturated solution of salt, is a good demonstration of this. After exudation, the stagnation is more confirmed, the red corpuscles being more closely aggregated; re-establishment of the circulation, therefore, does not take place so readily as before.

The matter first exuded is the serous part of the blood. It is subsequently, only, that coagulating lymph is exuded. How is this accounted for? That it is a mere physical phenomenon would appear from the circumstance, that analogous phenomena may be demonstrated by experiment. Thus Kürschner* found (and in general accordance with the results of his experiments are the results of the somewhat different experiments of Liebig† and of Bruecke‡) that water passes most quickly through animal membranes, and saline solutions more rapidly than gummy and albuminous solutions. Liebig measured the pressure required to force different fluids through animal membranes. Through an ox's bladder, water passed under a pressure of 12 inches of mercury, a saturated solution of common salt under a pressure of 18-20 inches, oil under a pressure of 34. The pressure required to make the fluids filtrate is in inverse proportion to the absorbing power of the membranes for the fluids. After a continuance of the experiment, less pressure was found necessary to produce the same effects, in consequence, Liebig thinks, of enlargement of the pores of the membrane. Like the fluids in these experiments, the blood, stagnant in the vessels of an inflamed part, is under the pressure of the force from behind; by the continuance of the operation of this force, the pores in the walls of the vessels may become enlarged and freely allow of the passage of the lymph, which they did not at first do. An important fact bearing upon this question has lately been made known by Professor Graham, viz., that albumen, when deprived of the salts which always exist mixed with it, by the action of aceticacid which does not coagulate it, is rendered eight times more diffusible than before. In inflammation, we have seen that before lymph exudes, the blood is the inflamed part has been deprived of some of its salts by the saline exudation that precedes; and it will be seen below, that the quantity of salts in the blood generally is diminished in inflammation.

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* Wagner's Handwörterb. der Physiol. Bd. i. p. 62.

† Untersuchungen über die Säftebewegung, p. 6.

‡ De diffusione humorum per septa mort. et. viv.

Section III.—State of the Blood and the Blood-vessels during the Healing Process in Man.

We have above seen reason to conjecture that inflammation of the conjunctiva, for example, from cold or from the irritation of a foreign particle in the eye, commences by constriction of the small arteries, which allows of the blood-corpuscles to accumulate in the capillaries and venous radicles. That in such a case, resolution is owing to dilatation of the arteries and coincident acceleration of the flow of blood, we have above seen equal reason to conjecture. Nay, we have above shown, by experiment on the frog, that dilatation of the arteries, and the coincident acceleration of the flow of blood, are the first steps to resolution of inflammation,—an experiment which, let it be repeated, is an interesting illustration of the *modus operandi* of stimulating collyria, applied to the eye, for the cure of catarrhal ophthalmia.

In traumatic inflammation in the frog, we have seen that the circulation in the affected part becomes free only in proportion as the interruption caused by the section of vessels is compensated for by the enlargement of anastomosing vessels. We have seen, that the vascular injection is chiefly on the side of the wound, opposite that on which the trunks of the cut vessels are, and this, contrary to what, I believe, might have been supposed, in the case of arteries as well as of veins. In the human body, in consequence of the great number of blood-vessels, both the arterial and venous trunks, implicated in a wound, will necessarily be found on all sides, hence the wound is equally red all round.

In traumatic inflammation in the human body, the inflammatory injection is often not confined to the vessels implicated in the wound, but the inflammation spreads to a greater or less extent around. What are the steps which lead to this *spreading of inflammation?*

In the case of a wound of the web of the frog, we have found that the vascular injection is very much increased by the application of one of the agents, which causes dilatation of the arteries. This is owing to a greater quantity of blood being poured into the vessels implicated in the wound than can escape by the limited and circuitous outlet which remains to them. If the spread of inflammation around a wound be in this manner owing to dilatation of the arteries leading to it, constriction of the arteries should limit the inflammation! And it is probably by doing so, that cold applications to wounds operate beneficially.

However this may be, we find that the edges of the wound, even after it is healed, continue injected for some time. The cause of this, we infer from our observations on the frog, to be, in part at least, that the anastomosing vessels are not yet large enough to compensate for the old vessels, free passage through which has been interrupted by their section. The redness may, in part, also be owing to a greater quantity of blood than natural, being still sent to the part in consequence of continued dilatation of the arteries. Here I may remark, that the two conditions, just spoken of, appear to me most probably to be those in which the blood and blood-vessels are in chronic inflammation.

It obviously does not come within the scope of our subject, viz. the state of the blood and the blood-vessels in inflammation, to enter into a detailed consideration of the changes which the exuded matter undergoes. In briefly describing the healing of wounds in the frog, we have indicated the changes which the exuded matter undergoes in that animal. Here it will be sufficient, briefly to indicate the changes as they take place in man:

When there is a wound, the exuded matter constitutes the blastema, out of which are developed the new tissues required for closing it. When adhesion, or union by the first intention, takes place, the new tissues which are developed are cellular tissue, blood-vessels, and epidermis, or epithelium,—the two former constituting the bond of union between the divided parts, the latter covering the surface of the cicatrix. When granulation, or union by the second intention, takes place, the exuded matter is converted into granulations and pus. The granulations consist of cells, in various stages of development into cellular tissue and blood-vessels. The pus, consisting of cells suspended in a fluid, serves the part of an epithelium, in protecting the granulations. In the new blood-vessels, the blood is loaded with red corpuscles, and, as in the frog, is probably either stagnant, or moves onward very slowly. The new substance, formed by granulation, having filled up the wound, contracts, and most of the blood-vessels shrink and disappear; whilst the formation of pus gives place to the formation of epithelium or epidermis, as the case may be, by which cicatrization is completed.

CHAPTER VIII.—OF THE STATE OF THE BLOOD OF THE BODY GENERALLY IN INFLAMMATION.

Of the deviations from the normal composition which the blood of the body generally has been found to present, the most constant and remarkable is an increase in the quantity of fibrin in the plasma. A still frequent, though less constant deviation, is a diminution in the quantity of red corpuscles. A still less constant deviation is an increase in the quantity of colourless corpuscles. These deviations, however, it is to be observed, are not peculiar to inflammation, nor even to a state of disease, as they occur in pregnancy, and after venesection, in health as well as in disease.

As regards the quantities of water and albumen in the blood in inflammation, conflicting accounts have been given.

From the analyses of Andral and Gavarret, it appears that the quantity of salts in the blood is diminished.

The following table is given, to serve as a standard by which the changes in the state of the blood in inflammation may be judged of.

TABLE, exhibiting the different accounts of the composition of healthy blood, given by the different authors who have occupied themselves with the chemical analysis of the blood in disease. *(From Henle's Handbuch der rationellen Pathologie.)*

In 1000 parts of healthy blood, there are contained:

	Red Corpuscles.	Water.	Fibrin.	Albumen.	Extractives.	Salts.
According to Lecanu	127	790	3	72		8
According to Becquerel and Rodier—						
In males	141·1	779	2·2	69·4	8·4	
In females	127·2	791·1	2·2	70·5	9	
According to Popp	120	790	2·5		88	
According to Zimmermann	127	—	3		80	
According to Simon—						
In the male	112·2	791·9	2·0	75·6	16·6	
In the female	106·0	798·6	2·2	77·6	12·6	
According to Christison—						
In the male	153·5	756·2	5·2		85·3	
In the female	120·7	795·2	2·5		81·6	
According to Hittorf—						
In female	126·4	793	1·4	67·4	11·5	

The plasma thus contains:

	Water.	Fibrin.	Albumen.	Extractives.	Salts.
According to Lecanu	904·9	3·4	82·5		9·2
According to Becquerel and Rodier—					
In males	907	2·6	80·4	9·8	
In females	906·4	2·5	80·8	10·3	
According to Popp	897·2	2·8	100		
According to Zimmermann	904·4	3·6	92		
According to Simon—					
In the male	894	2·3	86	18	
In the female	897	2·6	87	14	
According to Christison—					
In the male	892	6·2	100		
In the female	904	2·9	93		
According to Hittorf—					
In female	908	1·6	77	13	

Section I.—Increase in the quantity of Fibrin in the Plasma.

From the table above given of the results of the analyses of healthy blood, by Lecanu, Becquerel and Rodier, Popp, Zimmermann, Simon, Christison, and Hittorf, it oppears that the average quantity of fibrin is 2·6 parts in 1000 parts of blood and 3·005 in 1000 parts of plasma. As to the maximum and minimum quantities of fibrin in healthy blood, the analyses of Becquerel and Rodier give, as the maximum quantity, 4·0, and as the minimum quantity, 1·7 in the male; whilst in the female they give, as the maximum quantity, 2·9, and as the minimum quantity, 2·0. The extreme quantities presented by the analyses of Nasse are 2·8, 1·9; by those of Denis, 2·8, 2·5.

The maximum and minimum quantities of fibrin in the blood, in diseases generally, found by Andral and Gavarret, were 10·5, 0·6; the extreme quantities found by Popp were 13·3, 0·9. The maximum of fibrin in the plasma was thus, according to Andral and Gavaret, 11·8; according to Popp, 14·1; the minimum, according to Andral, Gavarret, and Popp, 1·0.

The quantity of fibrin in the blood in acute rheumatism is great, being, as appears from the analyses of Andral and Gavarret, on an average, 6·7. In pneumonia the quantity is even greater, the average being 7·5. In inflammation of mucous membranes, when extensive and severe, the increase of fibrin reaches a high figure. In inflammation of serous membranes, the average increase is to between 4 and 5. In extensive inflammation of the skin, as in erysipelas, the quantity of fibrin is great, being 6 or 7. In phlegmonous and furuncular inflammation, the figure is from 4 to 5. In acute meningitis, Andral and Gavarret put the quantity down at from 3.4 to 7. In cases of inflammation of the brain, from injury, Popp found fibrin to the amount of 4·8.

The increase of fibrin in inflammation has been found by Robert Latour and Colignon (Comptes Rendus, t. xix. p. 933), in arterial as well as in venous blood.*

Section II.—Diminution in the Quantity of Red Corpuscles.

The quantity of red corpuscles in healthy adults' blood, including both male and female, appears to be, from the results of the analyses above given of Lecanu, Becquerel and Rodier, Popp, Zimmermann, Simon, Christison, and Hittorf, on an average, 126 parts in 1000 parts of blood. In the male, the quantity of red corpuscles appears to be much greater than in the female. As to the maximum and minimum quantities of red corpuscles in the blood in health,—the earlier analyses of Denis gave, as the minimum quantity, 85·3; and, as the maximum quantity, 182·9. A subsequent analysis gave 82·9—119·4. The extremes presented by the analyses of Lecanu (the fibrin included along with the red corpuscles) were 115·8, and 148·4. The extremes, according to Becquerel and Rodier, are 113·0, and 152·0.

The maximum and minimum quantities of the dried remains of the red corpuscles in diseases generally found,—by Denis, were 186, and 71·4; by Andral and Gavarret, 185, and 21·0: by Popp, 140, and 59·1; by Becquerel and Rodier, 164, and 86·0.

In inflammation and acute rheumatism, as appears from the analyses of Andral and Gavarret, Simon, and others, the quantity of red corpuscles sinks, for the most part, below the physiological mean, but, except in rare cases, remains above the lowest physiological extreme.†

Section III.—Increase in the Quantity of Colourless Corpuscles.

It is commonly asserted, that the quantity of colourless corpuscles in the blood of the body generally, is much increased in inflammation. The assertion, though not unfounded, has been sometimes made on erroneous grounds. Thus, on the one hand, the quantity which may be found in the blood in health, has been estimated at less than it really is; and, on the other, the very great quantity found in the plasma which rises to the top of buffy blood, has been taken as an index of the quantity in the blood generally; whereas all the colourless corpuscles of the cupful of blood drawn, tend to rise to the tops where they remain suspended in the plasma, while the red corpuscles tend to sink to the bottom. Farther, the considerable accumulation of colourless corpuscles which may be seen in the vessels of the web of a frog's foot, when in a state of inflammation, has been adduced as indicative of an increase in the quantity of colourless corpuscles in the blood generally. This argument, at the best, is not better than the above mentioned one, founded on the accumulation of colourless corpuscles at the top, in buffy blood. But, in regard to the fact itself, it may be asked, if it be indicative of even a relative local increase in the quantity of colourless corpuscles? If there be more colourless corpuscles in the vessels, there are certainly also very much more red corpuscles.

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* In pregnancy, Nasse, and Becquerel and Rodier found an increase in the quantity of fibrin in the blood. According to Andral and Gavarret, it is only during the last three months, and especially the last, that the quantity of fibrin is increased; the mean for the last three months being 4, the last month 4·3. After moderate venesection, the quantity of fibrin in the blood increases, as appears from the various analyses, not anly in inflammation and certain other diseases, but also in health. When venesection is pushed beyond certain limits the quantity of fibrin diminishes.

† In pregnancy, as it advances, the quantity of red corpuscles diminishes. According to Becquerel and Rodier the quantity is, on an average, 112·6; the maximum, being 127, the minimum 87·7.

After venesection, the quantity of red corpuscles is almost constantly diminished, but in various degrees.

Admitting, however, that there is an increase in the quantity of colourless corpuscles, it is to be observed, that it is partly absolute, partly relative,—relative, as the quantity of red corpuscles is diminished.

According to Nasse and Popp, an increase in the quantity of colourless corpuscles is most frequent in pneumonia, and also in tuberculosis.*

Section IV.—Deviation in the Quantity of Albumen.

According to Becquerel and Rodier, the maximum and minimum quantities of albumen in the plasma in the healthy male, are 86 and 71;—in the healthy female, 87 and 73;—in pregnancy, 79 and 68. The same authorities found the mean quantity of albumen in the plasma to be in five cases of pleuritis 74; five cases of pneumonia, 69; eight cases of bronchitis, 74; four cases of acute rheumatism, 76. The quantity of albumen thus appears to be below the standard in inflammation. According to Andral and Gavarret, and to Simon, on the contrary, the quantity of albumen is much increased.

Section V.—Deviation in the Quantity of Salts.

The quantity of salts, in the plasma in inflammation and rheumatism, according to Andral and Gavarret, sinks pretty constantly below the normal standard 9·2, which they adopt from Lecanu, to 5·0.

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* The quantity of colourless corpuscles in the blood increases after venesection, both in health and inflammation. The increase is found especially remarkable in the horse. In regard to the fact above mentioned, on the authority of Nasse and Popp, that an increase in the quantity of colourless corpuscles is most frequent in pneumonia and tuberculosis, Professor Henle remarks, that it is perhaps to be explained by the circumstances, that in the diseases in question spitting of blood is common, and that the quantity of colourless corpuscles increases with the loss of blood.

Section VI—Deviation in the Quantity of Water.

The extreme quantities of water, found in the plasma of healthy blood by Becquerel and Rodier, were: in the male, 896 and 920; in the female, 896 and 916. From this it would appear, that the plasma in the female, is, on an average, a little less watery than in the male.

The extreme quantities of water in the plasma in disease are, according to Andral and Gavarret, 870 and 935; according to Becquerel and Rodier, 885 and 933; according to Popp, 885 and 920.

According to Andral and Gavarret, the plasma in inflammation contains, in by far the majority of cases, less water than natural—on an average, 884 and 898. According to Simon, also, there is less water. Later analysts, however, such as Becquerel and Rodier, Popp and Zimmermann, have found either no diminution in the proportion of water, or one in a much less degree than is indicated by Andral and Gavarret, and Simon.

Section VII.—Is there any relation between the Increase in the Quantity of Fibrin on the one hand, and the Diminution in the Quantity of Red Corpuscles, or Increase in Quantity of Colourless Corpuscles on the other?

The diminution in the number of red corpuscles, and the increase in the quantity of fibrin in the blood in inflammation, in the latter months of pregnancy, after venesection, &c.. taken in conjunction with the large quantity of red corpuscles, and comparatively small quantity of fibrin found in the blood in plethora and fever, suggested to the late Dr. Simon of Berlin, and to myself, the likelihood of the existence of some relation between the red corpuscles and the fibrin, similar to that which exists between the endogenous cells of a gland and its special secretion. In short, the red corpuscles, which disappear, were supposed to be resolved (in part according to Simon, wholly according to myself), into the additional fibrin which appears. This opinion is not to be confounded with an analogous one originally enunciated by Professor Henle, viz. that the corpuscles of the blood may be viewed as floating glandular cells. In holding this opinion Henle *did not suppose that the corpuscles form fibrin;* on the contrary, his opinion was, that fibrin has an independent origin.

In regard to the opinion, that the red corpuscles, which disappear in inflammation, &c., are resolved into the fibrin which appears, it is to be observed, that the inverse proportion in the quantity of red corpuscles and fibrin, though frequent, has not always been found to obtain; and when found, the diminution of the red corpuscles has not been in any regular relation to the increase in the quantity of fibrin. Moreover, the quantity of red corpuscles, which disappear, is quite disproportionate to the comparatively small addition to the quantity of fibrin, unless we choose to admit, that a large proportion of the red corpuscles, which disappear, may be accounted for by the great accumulation of red corpuscles in the vessels of the inflamed part.

There are still less grounds for believing in any relation between the increase of fibrin and of colourless corpuscles; but those who agree in the opinion, that the red corpuscles are developed from the colourless, will, perhaps, recognise a relation between the diminution in the quantity of the red corpuscles, and the tendency to the increase in the quantity of colourless corpuscles.

Section VIII.—Deviations in the Physical Characters of the Blood in Inflammation.

On the diminution in the quantity of red corpuscles depend various deviations in the physical characters of the blood,—such as specific gravity, consistence, capacity for heat and colour.

Specific gravity.—The blood, in inflammation, in common with many other diseases, has a specific gravity more frequently below than above the healthy standard. After venesection the specific gravity is diminished.

The constituent of the blood, which appears to have most influence on the specific gravity, are the red corpuscles. When they are numerous, the specific gravity is higher, and *vice versâ*. The diminution which may present itself in the specific gravity of the blood in inflammation and after venesection, may thus be dependent on the diminution in the quantity of red corpuscles, which, as above seen, is frequent in the blood, in general, in inflammation, and after venesection.

Consistency.—The blood, when first drawn in inflammation, appears thinner than natural, in proportion to the diminution of red corpuscles. As, however, the plasma contains more fibrin, the blood becomes more consistent as coagulation proceeds.*

Capacity for heat.—The temperature of the blood in general in inflammation, falls somewhat more rapidly than that of healthy blood. That the capacity of the blood for heat is in direct proportion to its density, appears from the fact, that in hemorrhage, the blood which is lost last, and which is known to be more watery, cools more quickly than that which escaped first. It may thus be inferred, that the diminution in the capacity of the blood for heat which appears in inflammation is owing to the diminished density, arising from the diminution in the quantity of red corpuscles.

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* Dr John Davy, Phil. Trans., 1822, p. 273.

Colour.—As the colour of the blood is dependent principally on the red corpuscles, so the greater their number, the intenser the colour of the blood, and *vice versâ.*

As the specific gravity of blood is in direct relation to the quantity of red corpuscles, it will be understood how intensity of colour may serve as an index of the specific gravity of the blood. This, in fact, as observed by Professor Nasse, is in direct proportion to the intensity of the colour. As the consistency of the blood generally is in relation to the quantity of red corpuscles, it will be understood how depth of colour may indicate the degree of consistency. After repeated bleeding at short intervals, the quantity of red corpuscles is diminished; the blood is, therefore, paler, and at the same time of less specific gravity and consistence. Again, as the capacity of the blood for heat is in proportion to the quantity of red corpuscles, the depth of colour will indicate the capacity of the blood for heat.

Section IX.—Deviation in the Process of Coagulation of the Blood in Inflammation.

On the increase in the quantity of fibrin in the plasma, together with the diminution in the quantity of red corpuscles, depends the deviation in the process of coagulation on which the formation of the buffy coat depends.

Coagulation of the blood, it is well known, is owing to the consolidation of the fibrin of the plasma. The consolidated fibrin forms a sort of felt-work of fibres, in the meshes of which are contained the corpuscles of the blood, and the constituents of the plasma which still remain in solution. For some time after coagulation the consolidated fibrin goes on to contract. By its contraction, the dissolved constituents of the plasma are pressed out, as from a sponge, in the form of serum; but the corpuscles are retained entangled in the coagulated fibrin. The red corpuscles are more loosely entangled than the colourless. The consolidated fibrin and the corpuscles thus constitute the clot.

As was pointed out by Mr John Hunter, the upper part of the clot is often firmer than the lower. In such a case it is found on examination that the firmer upper part is composed of a larger proportion of fibrin and colourless corpuscles, and a smaller proportion of red corpuscles, than the less firm lower part. This is owing to the red corpuscles, from their greater specific gravity tending to subside to the bottom, and thus leaving more plasma and colourless corpuscles at the top.

The upperpart of the clot of blood drawn in inflammation and in other states of the system, in which the quantity of fibrin is increased, and the quantity of red corpuscles diminished, is much firmer than usual, and of a yellowish colour. It contains few or no red corpuscles, these being all accumulated at the lower part of the clot. The upper part of the clot, when it presents the characters just mentioned, is called the *buffy coat.*

The buffy coat is owing to the red corpuscles subsiding to the bottom, before coagulation takes place, and leaving a stratum of pure plasma, with colourless corpuscles, at the top. It is the fibrin of this stratum of pure plasma coagulated, together with the colourless corpuscles, which constitutes the buffy coat. The colourless corpuscles, on account of their less specific gravity, and, perhaps, also their affinity for the plasma, have no tendency to subside along with the red corpuscles.

The buffy coat, in consequence of the meshes of the fibrin forming it not being occupied by the red corpuscles, like the meshes of the fibrin forming the bottom part of the clot, but occupied only by the comparatively fewer colourless corpuscles, contracts more than the lower part of the clot. The buffy coat is thus firmer and of less diameter than the lower part of the clot; and being, by the contraction, raised up at the margin all round, its surface is concave, or *cupped.*

Section X.—Cause of the more complete Subsidence of the Red Corpuscles of the Blood in Inflammation than in Health.

It was at one time supposed that the red corpuscles of the blood, in inflammation, subsided more completely than in health, simply because more time was afforded them for the purpose, from the blood coagulating more slowly. But that there is in operation some more essential condition which promotes the subsidence of the red corpuscles in the plasma than tardier coagulation, is shown by the fact, that although the blood, in inflammation, may be longer in coagulating, the subsidence of the red corpuscles, to a degree sufficient for the formation of a buffy coat, is found to have already taken place, before the time at which blood normally coagulates after abstraction; and that, therefore, even if the blood, in inflammation, coagulated more quickly than natural, which it, in fact, sometimes does, there would still be formed a buffy coat, as has been found to be the case.*

Another opinion as to the cause of the more complete subsidence of the red corpuscles was, that the plasma is thinner, and less viscid than natural. We have seen that, according to Andral and Gavarret, and to Simon, the plasma contains less water than natural; but, according to the later analysts, Popp, Becquerel and Rodier, and to Zimmermann, that there is either no diminution in the proportion of water, or one in a much less degree than appears from the analyses of their predecessors. That the plasma, in inflammation, is much, if at all, thinner than natural, is thus not a fact. That it is less viscid, is still less a fact, for we have above seen that the quantity of fibrin is increased.

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* Stoker, Pathological Observations, pp. 37 and 44. Dublin, 1823.

But it has been found, that in a thinner and less viscid plasma, the red corpuscles actually subside more slowly; and this, even though the plasma be slower in coagulating. Thus Mr Gulliver* mixed dilute saline solutions and urine with the blood, by all of which the consistency and specific gravity of the plasma were reduced, and its coagulation somewhat retarded. Yet in none of these mixtures was the falling of the red corpuscles so rapid, or the buffy coat so thick, as in some pure blood set apart for comparison. It is farther to be remarked, that in the thinner and less viscid serum, which does not coagulate at all, the red corpuscles also subside more slowly. Thus, as was first pointed out by Hewson, the red corpuscles more readily subside, in inflammatory blood, from the surface of the whole mass, than they will afterwards do from the surface of a mixture with the serum alone. This is well shown, in experiments recorded by Mr Gulliver.†

We thus see, that the more complete subsidence of the red corpuscles of the blood on which the formation of the buffy coat depends, is not owing either to slower coagulation, or to a thinner and less viscid state of the plasma. That it is, on the contrary, in some manner dependent on a more viscid state of the plasma, is a conclusion already indicated by what we have seen of the composition of the blood in inflammation, and which is confirmed by the results of experiments in which the blood was rendered artificially more viscid. In blood thus altered by the addition of a mixture of mucilage and salt, Mr Gulliver found that the red corpuscles always fell more rapidly than in blood thinned by the saline solution, sometimes as quickly as in pure blood, occasionally more quickly, and now and then with such velocity, that a clear floating portion of *liquor sanguinis*, two inches deep, appeared in five minutes. Again, in serum rendered thicker, heavier, and more viscid by the addition of mucilage, Mr Gulliver found, that the red corpuscles subsided not only more rapidly, but also more completely, than in serum rendered thinner, lighter, and less viscid by being mixed with a weak saline solution.

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* On the Buffy Coat, in Edinb. Med. and Surg. Journal, No. 165.

† Op. cit.

How does a viscid state of the plasma promote the subsidence of the red corpuscles? It has of late years been satisfactorily demonstrated by Nasse, Henle, Gulliver, and myself, that a viscid state of the plasma, whether arising naturally from the increase in the quantity of fibrin which is characteristic of buffy blood, or produced artificially by an admixture of white of egg or mucilage, promotes the subsidence of the red corpuscles, by increasing their natural tendency to become aggregated. To illustrate this, let us stop to compare the aggregation of the red corpuscles of healthy blood and of buffy blood.

Aggregation of the red corpuscles of healthy blood.—If a drop of blood, drawn from a healthy person, be forthwith examined under the microscope, we at first see the red corpuscles dispersed confusedly in the plasma; but, continuing to watch them, we see them in less than half a minute, run together into piles or rouleaux, as originally described by Dr. Hodgkin and Mr. Lister; and these piles we see arranged so as to present a net-like appearance, the meshes being small. The colourless corpuscles are seen either floating free in the plasma which occupies the meshes, or lying close to the piles of red corpuscles, without, however, forming a part of them. "This arrangement of rolls in a *network*," I have elsewhere observed (Br. and For. Med. Rev. for Oct. 1842), "is exhibited only when the blood is thinly spread out. When the blood is examined under the microscope in the form of a coagulated drop, the rolls are observed to be disposed in every direction, and thus to constitute a *sponge-work* in the interstices of which the *liquor sanguinis* is contained."

The aggregation of the red corpuscles of healthy human blood is represented in Figure 1 of Plate VI, and the aggregation of the red corpuscles of frog's blood in Figure 2 of the same Plate. It is seen that the aggregated red corpuscles of frog's blood do not form piles or rouleaux.

Aggregation of the red corpuscles of buffy blood.—If a drop of blood, drawn from a person labouring under acute rheumatism or inflammation, be examined microscopically in the manner above directed, the red corpuscles are not seen dispersed confusedly in the plasma, but are found to have already run together into piles or rouleaux. Continuing to watch, we see that these piles or rouleaux run more and more closely together into masses, leaving large spaces, with nothing but plasma.

The piles of the red corpuscles of buffy blood, in the act of running together into masses, are represented in Figure 3 of Plate VI. The mode in which the red corpuscles of frog's blood become aggregated when the blood is mixed with white of egg, is represented in Plate VII. The red corpuscles of the blood of young frogs, and frogs newly caught in the autumn, aggregate together in a somewhat similar manner.

The aggregations of red corpuscles, and the large intervening spaces with nothing but plasma, so far as they can be seen with the naked eye, were indicated by Mr. John Hunter as appearances characteristic of buffy blood. "The blood," says he, "has an increased disposition to separate into its component parts; the red globules become less uniformly diffused, and their attraction for one another becomes stronger; so that the blood, when out of the vessels, soon becomes cloudy, or muddy and dusky in its colour, and, when spread over any surface, it appears mottled, the red blood attracting itself, and forming spots of red. This is so evident in many cases, that it is hardly necessary to wait till the whole coagulates to form a judgment of it." Schröder van der Kolk has also called attention to the mottled appearance presented by a thin film of blood, as being equally characteristic of the state of the blood as the buffy coat itself. And I have identified the appearances with those observable under the microscope.*

It is easy to understand how, in consequence of the more rapid and close aggregation of the red corpuscles in buffy blood, just described, they should subside more quickly and completely than in healthy blood, in which the red corpuscles run together neither so quickly nor so closely. In the healthy state of the blood, the red corpuscles tend to sink in the plasma, but, as in the case of a loose floccule, the sinking goes on slowly. The consequence is, that coagulation has taken place before it has proceeded so far as to leave a stratum of plasma at the top quite free from red corpuscles; and so there is no buff. In blood which becomes buffy, on the contrary, the red corpuscles, in consequence of the closeness of their aggregation, form a mass, which, very different from a loose floccule, readily sinks. Furthermore, the sinking takes place the more rapidly, as the condition for it, viz. the close aggregation, is quickly established.

It has been above seen, that along with an increase in the quantity of fibrin, the condition on which the formation of the buffy coat essentially depends, there frequently co-exists a diminution in the quantity of red corpuscles. This favours the degree of development of the buffy coat by allowing of a thicker stratum of plasma to accumulate at the top.

Mr. Gulliver has called attention to the interesting fact, that during the formation of the buffy coat, the red corpuscles fall much faster after the first two or three minutes than before; the rate of sinking being commonly greatest between the third and sixth minutes, and sometimes later. Thus, in the *liquor sanguinis* of horse's blood, the red corpuscles subsided—

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* Edinburgh Med. and Surg. Journal, Oct. 1843.

In $2\frac{1}{2}$ minutes . .	$\frac{1}{8}$th of an inch.
$3\frac{1}{4}$ " . .	$\frac{2}{8}$ "
$4\frac{1}{4}$ " . .	$\frac{3}{8}$ "
$4\frac{1}{2}$ " . .	$\frac{4}{8}$ "
5 " . .	$\frac{6}{8}$ "
6 " . .	$\frac{7}{8}$ "
8 " . .	$\frac{11}{8}$ "
9 " . .	$\frac{4}{8}$ "
$10\frac{1}{2}$ " . .	$\frac{16}{8}$ "

At the end of fourteen minutes there was a film on the top; beneath which the *liquor sanguinis* was quite liquid; coagulation took place in sixteen minutes. Final perpendicular measurement of the upper buffy part two and a half, and of the lower red part one and three quarter inches.

The cause of this accelerated sinking of the red corpuscles is, no doubt, as Mr Gulliver suggests, the increasing aggregation of the red corpuscles during their descent. Is this increasing aggregation owing to increasing attraction among the red corpuscles? This is probable, from the accelerated sinking being in something like a geometrical ratio. May not the accelerated sinking be also in part owing to the progressively increasing viscidity of the plasma occasioned by the progress of the coagulation of the fibrin? It is, however, to be remarked, that this cannot be the case as regards the accelerated sinking in the serum, which Mr Gulliver has shown also to take place, though in a less degree.

CHAPTER IX.—OF THE RELATION BETWEEN THE STATE OF THE BLOOD OF THE BODY GENERALLY IN INFLAMMATION, AND THE INFLAMMATION ITSELF.

The essential phenomena of inflammation may occur when the blood of the body generally is in a perfectly healthy state. This might be inferred from what we observe in the frog; and from what occurs in the case of a simple wound in man, between the time of infliction of which, and the establishment of the inflammation, no change in the state of the blood of the body generally is to be detected. But it has been actually shown by Andral, from direct observation, that in inflammation the blood of the body generally may remain without change. On the other hand, that the change in the state of the blood, which we have above seen to be of frequent occurrence in inflammation,—viz. increase in the quantity of fibrin, and diminution in the quantity of red corpuscles,—may exist without inflammation, is proved by the circumstance, that it occurs naturally in the latter months of pregnancy. Still it is to be observed that, according to Andral, the increase in the quantity of fibrin, and diminution in the quantity of red corpuscles in any great degree, under other circumstances, is always preceded by inflammation. In short, though inflammation may run its course without any change in the state of the blood of the body generally, still, when an inflammation attains to a certain extent and intensity, then an increase in the quantity of fibrin in the blood takes place, and usually along with it a diminution in the quantity of red corpuscles.

According to Andral, the increase in the quantity of fibrin in the blood is always simultaneous with the accession of inflammatory fever. In inflammation without fever, the blood presents no increase in the quantity of fibrin. After the cessation of fever, when it has existed, the quantity of fibrin is found to be again normal. In what relation do the increase in the quantity of fibrin and the inflammatory fever stand to the inflammation, and to each other? Inflammation, as the first link of the chain, it has just been seen, may exist without increase in the quantity of fibrin in the blood. It may also exist without fever; but increase in the quantity of fibrin, and fever, we have seen, often supervene on inflammation. Does the inflammation cause the fever, and this the increase in the quantity of fibrin,—or does the inflammation cause the increase in the quantity of fibrin, and this the fever? That it is the increase in the quantity of fibrin which causes the inflammatory fever, is probable from the fact that, except in the case of pregnancy, chlorosis, &c., in which the increase in the quantity of fibrin takes place slowly, an increase in the quantity of fibrin is not met with without fever. That the increase in the quantity of fibrin is directly owing to the inflammation, appears from the fact pointed out by Andral and Gavarret, that when inflammation supervenes in the course of typhoid fever, the fibrin, from being less in quantity than natural, becomes greater.

From what we have above seen of the state of the blood in the vessels of an inflamed part, we can readily understand; how, although inflammation be independent of an increase in the quantity of fibrin in the blood, still that when this has taken place, the spread and intensity of the inflammation may be promoted by it.

[The facts detailed in this paper are illustrated by nine coloured lithograph drawings; for these, readers are referred to Guy's Hospital Reports. Second Series, Vol. vii., Part i.]

ART. VI.—*On the Mortality of Cholera among the European Troops of the Indian Army.* By JAMES STARK, M.D., F. R. S. E., F. R. S. S. A, Fellow of the Royal College of Physicians of Edinburgh.

ONE of the greatest misfortunes which can befal any inquiry is to have an individual to write its history already predisposed to regard it from a particular point of view. In such a case it is next to impossible that the subject can receive justice at his hands, and it will be the result of chance, and not of an unbiassed inquiry, if the facts coincide with the conclusions deduced from them.

With regard to the question of the mortality of cholera in the Indian army, it has unfortunately happened that all the later writers on the subject have been more or less closely connected with India. These, sincerely believing that the mortality from cholera had been over-rated, most naturally fell into the opposite extreme; and, from the limited facts they adduced, and also from not comparing its mortality with that of other diseases, concluded, that "cholera is neither so frequent nor so fatal as it is generally reported to be." Or, as is concluded by an eminent statist, "It will be a consolation to those connected with India, on referring to these facts, to find that an exaggerated view is generally taken of the diminished value of life in India, and of the loss occasioned by spasmodic cholera." In fact, the object of the late papers on this subject has been to "show the fallacy and groundlessness of the exaggerated opinions held in this part of the globe with reference to the extent and intensity of this destructive disease."

Having the highest personal regard for those gentlemen who have adopted what I believe to be an erroneous view, feeling also confident that their regard for the propagation of truth will induce them to forgive me for endeavouring to show the real state of matters, I proceed to state shortly the facts of the case, and also the principles which ought to guide us in deducing conclusions from the facts known regarding cholera.

Cholera is a disease which, though endemic to India, and forming a considerable portion of the annual mortality, yet only breaks out as an epidemic at intervals of several years. With a disease having this peculiarity it is clearly impossible to arrive at any just estimate of its actual mean mortality from a one year's, a five years', or even a ten years' observation. For five, eight, or ten years, its mortality may be comparatively small, but when it breaks out as an epidemic it may cut off at one fell swoop a fourth of the total force, as it did with the 86th Regiment at Kurrachee in June 1846.

Again, the mortality from cholera may appear small with regard to the strength of the army, and yet be high as compared with the fatality of other known diseases. This subject must also be looked into before we can venture to affirm that the mortality of that disease is either high or low.

All the papers on the mortality of cholera in the Indian army which I have met with have had their periods of observation limited to a few years, and therefore did not fulfil the conditions which I regard as essential to the investigation of the fatality of a disease like cholera.

Three returns, however, are known to me which extend over periods of years sufficiently long to give an approximation to the mean fatality of cholera. The first is entitled "Returns showing the sickness, mortality, and invaliding in the Honourable East India Company's Armies in the Presidencies of Bengal, Madras, and Bombay respectively, from 1825 to 1844 inclusive." This was a return made to an order of the House of Commons of date 16th June 1845, and was printed 17th February 1847, being No. 76 of the Parliamentary Papers of the Session 1847.

The second return I owe to the kindness of my friend, the late Dr Henry Marshall, Deputy Inspector-General of Army Hospitals. It is a manuscript copy of an official return prepared at Madras, but not yet published, so far as I can learn, entitled, "Tables showing the comparative prevalence and mortality of the principal classes of disease amongst Her Majesty's Troops serving in the different stations in the Madras Presidency, from the year 1826 to 1843 inclusive, with a general table for the whole Command for the same period." It is dated from "The Queen's Medical Department Office, Madras, July 1844." This return does not include the force employed on field service at Rangoon; the mortality from which, in the table below, is extracted from Colonel Tulloch's excellent official reports.

The third return, though only extending over a period of twelve years, is that published by a committee of the Statistical Society of London, "On the sickness, mortality, and invaliding among the troops in the Madras Presidency." This return embraces both the Queen's troops and the East India Company's troops. The following table is constructed from these varied sources, and is limited to European troops alone.

Table shewing the Deaths from Cholera and their proportion to the 1000 *of strength among the European Troops in the Presidencies of Bengal, Madras, and Bombay.*

European Troops.	Authority.	Years.	Strength.	Total Deaths.	Cholera Deaths.	Ratio total deaths to 1000 of strength.	Ratio cholera deaths to 1000 of strength.
E. I. Co.'s Troops, Bengal.	Parliamentary Papers.	1825-44	88,380	6531	1021	73.8	11 55
Do. Madras.	Do.	Do.	101,210	3892	432	38.46	4.27
Do. Bombay.	Do.	Do.	50,967	2589	288	50.78	5.64
Queen's Troops, Madras.	MS. Tables.	1826-43	121,354	5825	1232	48.0	10.1
Do. Rangoon.	Tulloch.	1824-26	3,004	1340	48	446.0	16.0
Total European Troops, Madras.	Statistical Society.	1827-38	127,925	6621	974	48 63	7.6
Total,			492,860	26,798	3995	54.3	8.1

This table shows that, out of an aggregate strength of 492,860 European troops in all parts of India, 54·3 per thousand men died from all causes, and of these 8·1 per 1000 men from cholera.

A comparison, however, of the mortality returns of the Queen's troops, and the Hon. East India Company's troops, in the Madras Presidency, leads to the conviction that some serious error has been committed with regard to the number of deaths from cholera among the East India Company's troops there. It is not credible that the Queen's troops would lose by cholera in the proportion of 10·1 per thousand men annually, while the Company's European troops only lost in the small proportion of 4·27 men annually out of every 1000 of strength,—or less than a half by the same disease. Men who are natives of the same country, who are quartered together, and live in all respects alike, never exhibit such a marked difference under the same disease as is noticed in the above table.

Again, we know from independent sources, that cholera raged severely in the Madras Presidency during the years 1832 and 1833; and again, during the years 1837 and 1838, and still again, in the years 1842 and 1843. Yet, the mean annual mortality of cholera during these years, according to the above quoted parliamentary returns, was, among the East India Company's European troops at Madras, only 5·48 per 1000 men; whereas we have every reason to believe it was more than double that amount. Thus Colonel Sykes mentions that the mortality from cholera in the army at Madras amounted to 13·50 per 1000 men in 1842, and to 16·57 per 1000 men in 1843,—a slight discrepancy, it must be confessed, between the parliamentary return and that to which the Colonel had access in the India House. The Committee of the Statistical Society give the rate of mortality from cholera among the European troops at Madras at 21·1 deaths per 1000 men in 1832, and at 22·6 deaths per

1000 men in 1833. As these statements, therefore, are quite irreconcilable with the parliamentary returns relative to the East India Company's troops at Madras, and seem to prove to demonstration that some serious error exists in it, it would be safer to leave it out of consideration at present.

The very fact that some error seems to exist in the parliamentary returns relative to the mortality from cholera at Madras, inclines us to look with suspicion on the returns from Bombay also. The valuable papers of Mr Edmunds in the Lancet have satisfactorily demonstrated that the mortality from all diseases is always much higher at the Bombay than in the Bengal Presidency. Yet the above table shows that the parliamentary returns make it appear quite otherwise; for, while it assigns a general mortality to Bombay of only 50·78 deaths annually in every 1000 men, it makes the average fatality at Bengal reach 73·8 deaths annually in 1000 men, Colonel Tulloch, however, sides with Mr Edmunds in showing that the mortality of Bombay exceeds that of Bengal. In his late paper "On the mortality of her Majesty's troops serving in the colonies during the years 1844 and 1845," (Statistical Journal, 1847,) he states that the mortality of the royal troops in the Bengal Presidency was only at the rate of 40 deaths annually out of every 1000 of strength, while at Bombay it was no less than 105 deaths annually during these years out of every 1000 men.

It is right these circumstances should be stated, lest we place too much reliance on the apparently small proportion of cholera among certain troops in the Madras and Bombay Presidencies, and be thereby led to arrive at very false conclusions. Of course I consider the only unobjectionable returns in the above table those of the East India Company's troops in Bengal, those of the Queen's troops in Madras, and those of the Queen's at Rangoon, which would give in an average mortality of 11 deaths annually from cholera in every thousand men. But that I may not be accused of wishing to exaggerate the mortality, the remarks which follow will apply to the mean of the above table.

The important question therefore now comes, viz., "Is a mortality of 8·1 annually out of every thousand men a high or a low proportion?"

As we are speaking of British soldiers, in endeavouring to answer this question, we must look at the proportion in which those diseases, which the world recognises to deserve the epithet of *fatal diseases*, cut off our home population.

There are certain diseases to which mankind has attached the epithet of *fatal, mortal, or deadly diseases.* Consumption, typhus fever, and pneumonia, are the diseases which cut off by far the largest proportion of adults in this country. Measles, scarlet fever, hooping-cough, and convulsions, are the diseases most fatal to our children. What then is the proportion in which these diseases prove fatal to our population?

Taking a five years' average of the mortality of England and Wales (1838-42), the following is the proportional annual mortality of the most fatal diseases to a thousand of the general population:

Consumption cuts off	3·880	annually in every	1000 living.
Convulsions ...	1·660	...	...
Pneumonia ...	1·197	...	...
Typhus Fever ...	1·080	...	...
Dropsy ...	0·830	...	...
Scarlet Fever ...	0·816	...	...
Small-Pox ...	0·613	...	...
Measles ...	0·558	...	...
Hooping-Cough	0·517	...	...

There are no other diseases in this country which prove more fatal than these. We all acknowledge that these diseases deserve the epithet of *fatal* diseases,—they produce great ravages,—they constitute a very large proportion of the total mortality,—and are the great open doors by which our population descends to the grave. Yet how trifling is the mortality of any of these as compared with that of cholera among the European troops in any of the presidencies in India. Our most deadly disease—consumption—is less than half as deadly as the mean mortality from cholera in all the Presidencies, even taking the returns with all their errors; while in the Bengal army, no fewer than three die from cholera for every one who dies in this country from our most deadly scourge. Fever, the scourge of our towns, has a mean mortality so infinitely less than cholera in the Indian army, that we must cease to complain of it *as a scourge*, if we are to reckon its mortality and virulence by comparison with the cholera in India. Why only one dies from fever in this country for every eight who die of cholera in our Indian armies; one for every ten who die of cholera among the royal troops in the Madras Presidency; and one for every eleven who die of cholera among the Company's European troops in Bengal!

As to our other fatal diseases their proportional mortality is so trifling in comparison with the cholera in the Indian army, that it would be only waste of time to compare their fatality with a scourge like cholera.

But let us look at this matter in another light, and compare the mortality of cholera in India with that of the chief diseases to which our troops are subject at home.

Fevers (including the eruptive fevers) cut off our troops in the following proportions:

Dragoons and Dragoon Guards	1·5	men annually out of every	1000 men.
Household Cavalry ...	1·8	...	...
Foot Guards ...	2·0	...	...

All proportions infinitely less than that of the mortality from cholera in the Indian army. Stomach and bowel complaints in all their numerous forms cut off our troops in the following proportions:

Household Cavalry ...	0·2	of a man annually out of every 1000 living.
Foot Guards	0·7	... ...
Dragoons and Dragoon Guards	0·8	... ...

Brain diseases cut off from 0·6 to 1·0 annually of every 1000 of our troops at home.

But the class of diseases most fatal to our troops at home is out of all proportion diseases of the respiratory organs, and notably consumption. This disease, indeed, is the fatal scourge of our troops, amounting from a third to a half of the total mortality. Thus consumption in the

Dragoons and Dragoon Guards cuts off	5.2	per annum	out of every 1000 men.
Household Cavalry, ...	7·4	...	...
East India Corps Depot, ...	8·3	...	...
Foot Guards, ...	10·8	...	...
Mean, ...	7·9		

In other words, the most fatal scourge of our troops at home does not come up to the average fatality of cholera in the Indian army, even according to the above under-estimated table, while it is one-half lower than its fatality in Bengal, and twice as low as its fatality at Rangoon.

But why compare the fatality of cholera in the Indian army with that of separate diseases, when we find that the above under-estimated mean mortality of that disease in India is very little below that of the mortality among the metropolitan police force, which only averages 9·0 annually per 1000 men—little below the average fatality among those insured at the Equitable Life Assurance, between the ages of 18 and 40, only 10 of whom die annually out of every 1000 insured—little below the total mortality among the males of England and Wales between the ages of 20 and 40, only 10 of whom die annually out of every 1000 living.

If, however, from the above under-estimated average of deaths from cholera we turn to that among the individual troops of the different presidencies, we find that the mortality from that single disease among the Queen's troops in the Madras presidency, or among the East India Company's troops in the Bengal presidency, exceeds the total mortality from all diseases among the metropolitan police, exceeds that among the insured at the Equitable, exceeds that among the adult males of England and Wales.

All these facts, then, demonstrate in the clearest manner that cholera in the Indian army is both a very virulent and a very fatal disease; and pointing to these facts I would appeal even to the defenders of the theory, that "cholera is neither so frequent nor so fatal in India as it is generally supposed to be," if the facts do not demonstate that cholera in India is a far more frequent and a far more fatal disease than even our most fervid imaginations supposed it to be.

Edinburgh, 21 *Rutland Street.*

ART. VII.—*Some Account of the Life and Scientific Writings of* WILLIAM PROUT, M.D., F.R.S., Fellow of the College of Physicians, London.

WILLIAM PROUT was born on the 15th of January 1785, at Horton, a village in Gloucestershire, on the borders of Wiltshire, in the parish of Horton. The few houses in Horton are said to be so little continuous, that they scarcely constitute a village; the place itself is distant from any public road; and though there is a handsome mansion house and neat church, yet for forty years neither squire nor clergyman has been known to be resident. The parents of William Prout were in independent circumstances; and the family had resided for some generations on their own property.

William Prout, when at a tender age, learned reading at a dame's school in the neighbouring market town; and he was subsequently taught writing and arithmetic at the village school of Badminton, also in the neighbourhood. Dr Prout was in after life in the habit of mentioning a circumstance, which is probably to be referred to this period. He suffered much from pain in the ear; and often he has said, when he went to bed, he used to cry for a long time until he fell asleep. It is not unlikely that at this time he was labouring under inflammation of the tympanal cavity; and that the effect of this disorder, not counteracted or controlled in any efficient manner, had been the cause of the deafness with which he was afflicted in adult life. From this time, when he was probably about the age of thirteen, William Prout was entirely self-taught, until he attained the age of seventeen years. No authentic information has been procured, to show in what manner his time was occupied at this period. It is merely known, that at a very early age, he evinced a strong taste for the cultivation of mathematics and mechanics, with great fondness for music; that during the years which he spent at home his studies were chiefly mathematical; and that he showed his aptitude and talent for mechanics by constructing an organ, and an electrifying machine.

At the age of seventeen years, prompted by a strong desire for the acquisition of knowledge upon a more systematic plan than it had been in his power to observe, Mr Prout went to the private academy of the Reverend Mr Turner of Sherston, Wilts; and there, for the first time, he acquired a knowledge of the Latin language, and also the elements of the Greek. After remaining about eighteen months at this institution, he returned to the paternal roof, and once more pursued his studies without assistance.

The mind of William Prout, however, was one which had both sagacity to perceive its own deficiencies and energy to endeavour to have them supplied. After proceeding upon the system of solitary, and perhaps rather desultory study, for about eighteen or twenty months longer, he felt so strongly the imperfection of his education, that he inserted in one of the local newspapers an advertisement, requesting information as to an eligible place for completing the education of one brought up in his peculiar circumstances. In consequence of this proceeding, he entered when in his twenty-first year, a private academy or superior school, kept by the Reverend Dr Thomas Jones of Redland, near Clifton. Here he applied himself diligently and systematically to the study chiefly of the classics, opportunities and facilities for studying which, with the requisite attention to render the knowledge profitable, he had not previously enjoyed. By the advice of Dr Jones he taught the younger pupils, as the most effectual method of instructing himself at the time of life he had reached.

At the same time he extended his knowledge of mathematics and mechanics; and began to devoted attention to chemistry. One of the pupils was inquisitive about this science; and in order to satisfy his curiosity, Mr Prout performed such experiments as with the explanations might tend to communicate instruction.

In these occupations Mr Prout spent about two years, and began to consider what might be the most eligible profession as an occupation for life. In this inquiry he was aided by Dr Jones, who strongly recommended to him the study of medicine; and for that purpose advised him to proceed to Edinburgh.

Dr Jones had previous to this time acquired the friendship of Dr Alexander Adam, at that time rector of the High School in Edinburgh, a man well known as a most profound and accurate classical scholar, and whose reputation stood high with many able scholars in England, in consequence of his writings, and especially his work on Roman Antiquities. To this venerable and excellent person Dr Jones gave Mr Prout a letter of introduction, which afterwards exerted a remarkable influence on the subsequent life of the bearer. Mr Prout arrived in Edinburgh when he was twenty-three years of age, in the month of October 1808, and immediately began attendance on the medical lectures in the university.

Mr Prout remained in Edinburgh and the neighbourhood the whole prescribed period of three years, attending lectures and reading with great diligence and regularity. The first summer, during which sometimes English students were then in the habit either of returning homeward, or of going on a excursion to the Highlands, Mr Prout spent at Duddingston; the second summer he resided in the village of Morningside; and in both instances availed himself of the use of the university library. The third summer, namely, that of 1811, he obtained the degree of doctor in medicine on the 24th of June. The Dissertation which in compliance with academical rules he defended was on the subject of Intermittent Fevers.

From Edinburgh Dr Prout proceeded to London, and there he continued his professional studies by diligent attendance at the Borough Hospitals, Guy's and St. Thomas's, at which establishments he enjoyed opportunities of acquiring practically that knowledge of disease, and the best methods of treating it, which alone can make a useful physician.

In this manner he spent other two years, till 1813, when he went to reside in Arundel Street in the Strand. In this situation Dr Prout had begun to give proof of the extent and accuracy of his attainments.

At that period, though chemistry had been for several years a science of great and increasing interest and importance, and had attracted numerous pupils, yet animal chemistry, partly from the difficulty of prosecuting it successfully, was still in a very imperfect and rudimentary condition, and furnished little accurate information. The View of the Progress and Present State of Animal Chemistry, by Jons Jacob Berzelius had indeed been published at Stockholm, and had just appeared in the form of an English translation at London;* and sometime before that the researches of Allen and Pepys on Respiration had appeared in the Philosophical Transactions. These writings, however, served rather to show the defects and imperfections of the chemical knowledge of organized bodies, than to communicate much satisfactory information; and if they proved the importance of the subject, they showed the difficulties by which investigation is attended.

It was at this time, that Dr Prout undertook to deliver lectures on that department of chemical science, to which he had already devoted himself, with the energy of one who is impressed both with the importance and the difficulties of the subject. He delivered a course of lectures on animal chemistry. The class was small; but so highly was the lecturer esteemed as an able practical chemist, and one capable of communicating correct information on a subject difficult and little understood, that among the audience Sir Astley Cooper, at that time surgeon to Guy's Hospital, was a regular attendant.

The first occasion on which Dr Prout appeared as a writer subsequent to the publication of his inaugural dissertation appears to have been in November 1813, when he published in the Annals of Philosophy, recently commenced by Dr Thomas Thomson, a Memoir on the Quantity of Carbonic Acid Gas emitted from the lungs during respiration at different times and under different circumstances.*

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* A View of the Progress and Present State of Animal Chemistry. By Jons Jacob Berzelius. London, 1813, 8vo.

These observations, described in this manner, were made subsequent to the elaborate experiments of Allen and Pepys, the essay of Dr Bostock, and the paper of Mr Brande.†

It was ascertained by some of the early experimentalists on the function of respiration that the quantity of oxygen gas consumed and of carbonic acid gas formed during the act, varied considerably in the same individual in different states of the system. The circumstances chiefly noticed to modify this amount of the chemical products are, the temperature of the air respired, the degree of muscular exertion, the state of the digestive organs, the kind of food employed, and the condition of the system as influenced by the presence or absence of fever. The full effect of some of these circumstances Dr Bostock proposed to examine in a third part of his essay. This part, however, was not published, unless we are to understand, that it appeared in the work on physiology which he many years afterwards gave to the world.

It was in order to obtain some accurate information on this obscure part of the subject that Dr Prout entered on the experimental inquiry, the results of which are given in this essay.

He informs us, that having, with this view, contrived a simple apparatus by which he could easily, and with considerable accuracy, analyse the respired air, he placed himself on a sort of regimen, which consisted in keeping himself as nearly as possible in the same state in every respect for the space of upwards of three weeks. During this time he made experiments every hour, sometimes oftener, during the day, and occasionally also during the night. By persevering in this course he obtained a large body of evidence, embracing many hundreds of experiments, the results of which were generally consistent. From these he was enabled to establish the two following laws.

Law I. The amount of oxygen gas consumed, and, consequently, of carbonic acid gas formed during respiration, is not uniformly the same during the twenty-four hours, but is always greater at one and the same part of the day than at any other; that is to say, its maximum occurs between the hours of 10 a.m. and 2 p.m., or generally between 11 a.m and 1 p.m.; and its minimum commences about 8 h. 30′ p.m., and continues nearly uniform till about 3 h. 30′ a.m.

Law II. Whenever the quantity of oxygen gas consumed, and consequently of carbonic acid gas formed, has been by any cause increased or raised above the natural standard of the period, it is subsequently as much decreased or depressed below that standard, and *vice versa*.

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* Annals of Philosophy, Vol. ii., p. 328, November 1813. London, 1813.

† Nicholson's Journal, Vol. xi.

The first law is subject to some variations, but Dr Prout never observed that it was liable to any exception. In all his experiments it was constantly observed, that a greater quantity of carbonic acid gas was given off in the middle of the day than at any other period of the nycthemeral space. In general the degree and order of these variations are the following.

The quantity of carbonic acid gas which remains stationary at 3·30 per cent. the minimum during the night, begins suddenly about 31·30 a. m., suddenly to increase, at first slowly, afterwards more rapidly till about noon, when it is usually as high as 4·10 per cent. its maximum. After this time it begins to sink, at first quickly, then more slowly, till about 8·30 p.m., when it again attains the minimum rate, 3·30.

From the peculiar order and time at which these oscillations take place, Dr Prout, offers the conjecture, that these variations may depend on the presence and absence of the sun. He admits, however, that the question must be decided by subsequent observations. All that can be said is, that certainly the presence of the sun and solar light have very great influence upon the functions both of plants and of animals; and it is quite in accordance with many observations to think, that the decarbonizing power of the lungs may be most energetic while the sun is above the horizon, and the influence of light and heat is greatest.

Dr Prout further found that the first law was liable to variations,

1st, In the quantity of carbonic acid gas as given off by the same individual in different days; and

2d, In its quantity, as given off by different individuals.

As to the first Dr Prout observed the variations several times; and was led to infer that when the increase is considerable it depends upon an electrical state of the atmosphere. Depressions or diminutions, he occasionally traced to abstinence in the use of food.

As to the second form of variation he found that the quantity of oxygen gas consumed, and consequently of carbonic acid gas, formed in a given time, by different individuals is very different. The lowest is that by himself or 3·45 cubic inches; the next is the estimate by Sir Humphrey Davy, from 3·5 to 4·5 cubic inches; and the next is by a friend of Dr Prout, under precisely the same circumstances, and about the same age, namely, 30 years; both being of regular habits and in perfect health.

The circumstances under which the quantity of carbonic acid gas is increased appear to be comparatively few. Those under which it is diminished are very numerous, and the effect of the latter are both greater and more permanent.

Exercise, if not long continued and carried to fatigue, increases the amount. When long continued so as to fatigue, the amount is diminished. The same effect is produced under the operation of the exhilarating passions.

As to food, long abstinence diminishes the quantity of carbonic acid gas eliminated; yet not to so great a degree as might be expected.

The following observations on the effects of the use of spirituous and fermented liquors are important in showing, how these agents impede the proper functions of the lungs in eliminating carbonaceous matter from the system. Alcohol and all liquors containing it which were tried, diminish the amount eliminated, much more than any other article or circumstance subjected to experiment. Under the use of porter, even the amount diminished is reduced below the standard; while the reverse was the case when water only is taken. The experiments made on this subject furnished results which fully convinced Dr Prout, that the use of alcohol in every state and in every quantity uniformly lessens in a greater or less degree the quantity of carbonic acid gas eliminated, according to the quantity and the circumstances under which it is taken. When alcohol, either pure or diluted, is taken upon an empty stomach its effects are remarkable. These effects appear to take place almost instantaneously; and the depression in the amount of carbonic acid gas extricated is the greatest. After a short time, however, the powers of the constitution appear to rally, and the quantity emitted is rapidly increased; then it again sinks, and afterwards slowly rises to the standard. This same species of oscillation Dr Prout generally observed when the quantity has been suddenly and greatly raised or depressed from any cause; and he thought it might arise from the circumstance, that the animal powers are required to counteract the effects of a poison or other noxious agent, which might then stimulate them to overact their natural capabilities.

When vinous liquors are taken upon a full stomach, as after dinner, their effects are more slow, but not less sure and remarkable. Dr Prout thought them even more permanent; but this, he admits, might arise from their having been taken in larger quantity, than he chose to do when the stomach was empty. As long as their effects are perceptible, so long is the quantity of carbonic acid emitted below the standard. With the experimenter himself these effects used to go off with frequent yawning, and with a sensation as if he had just awaked from sleep. Under these circumstances he found the quantity generally much above the standard, and hence he thought it probable that the system was then freeing itself from the retained carbon.

It thus appears that vinous and spirituous liquors, which are generally accounted stimulants, though they may stimulate under certain circumstances and in certain doses the mucous surface of the stomach and alimentary canal, and even the interior of the blood-vessels into which they are received, act nevertheless as powerful sedatives, by preventing the elimination and causing the retention of carbonaceous matter, which in the normal and natural state ought to be eliminated. This circumstance further accounts for the loss of heat which invariably follows the administration and use of these liquors.

It is further a curious and important observation that very similar to the effects of alcohol are those of strong tea, whether warm or cold.

The depressing passions, as anxiety, grief, solicitude, uncertainty, in short, whatever produces that peculiar sensation which induces yawning, sighing, or any other deep inspiration, have evidently the effect of diminishing the quantity eliminated; these appearing, indeed, to be so many involuntary acts, by which the system endeavours to get rid of the retained carbon.

At the close of the essay Dr Prout makes the following general observations on the particular organic system through which these effects may be supposed to take place, and also the influence of solar light.

"Of the causes operating to produce the above variations, no doubt the state of the circulation is to be considered as one. It is impossible but to suppose that when, *cæteris paribus*, a greater quantity of blood is exposed in a given time to the action of the air, that a greater quantity of carbonic acid gas must be formed, supposing this, at least, to be a common chemical process. It must, I think, be admitted, therefore, that this cause contributes in some degree to the production of the phenomena in question, though, there is every reason to believe, in a very limited one. A very superficial examination of the above experiments will show that the quantity of carbonic acid gas formed bears scarcely any proportion to the numerical state, at least, of the pulse. This, indeed, I admit to be a very imperfect criterion of the quantity of blood circulating through a part in a given time, unless its strength and degree of fulness be taken into the account; but it might be asked, has the pulse been noticed to be uniformly stronger and fuller in the middle of the day than at any other time? and is it not constantly so under the operation of hard exercise and the influence of wine?

"Mr Brodie, in his excellent dissertations on the effects of poisons, has apparently demonstrated that respiration is altogether dependant on the brain; since, when the operations of this organ were destroyed or cut off, it almost immediately ceased; while the heart, which he found much less under nervous influence, continued for some time to act, and circulate dark coloured blood. He found also that alcohol, the essential oil of bitter almonds, and some other poisons, act as such simply by destroying the functions of the brain apparently by sympathy, and not by absorption; and that under the operation of these, respiration soon begins to be ill performed, and if their quantity has been great, at last entirely ceases. This, then, while it enables us to account for the effects of alcohol in our experiments, seems also at the same time to prove, in general, that another cause besides the mere state of the circulation is immediately and largely concerned in the production of the phenomena in question. I conclude, therefore, that the *nervous system*, acting partly through the medium of the blood, and immediately by its influence over the function of respiration, is the grand source to which we must refer them all.

The laws which we have attempted to establish are no other than modifications of that general principle which prevails over all living actions. A state of depression ever follows a state of excitement; and the greater that excitement has been the greater is the consequent depression. On the other hand an uniformity of action at any point of the scale within which it ranges is no less incompatible with life than a great and sudden deviation towards either extreme. In all living actions, therefore, states of comparative rest alternate with states of exertion; and these alternations are evidently connected with the presence or absence of the sun; for according as this 'great source of life and heat' is present or absent, are organized beings, in general, either awake and active or asleep and inactive. Now at noon this powerful agent of nature is at its height, and hence at this time may be supposed to exert his maximum energy; whatever, therefore, is under his immediate influence, must now be supposed to be affected most strongly; and if the hypothesis be correct, that nervous action is so, it is perhaps easy to account for many important phenomena which it presents, and, among others, that of the greater elicitation of carbonic acid at noon, respiration being considered as under its immediate influence."

For the account of the apparatus employed the readers will consult the paper itself.*

The subsequent year, namely, in November 1814, Dr Prout published in the same journal some supplementary observations on this subject.

Dr Prout had mentioned in his first paper, that he was much struck with the sudden increase in the amount of carbonic acid eliminated from the lungs in the morning about the commencement of twilight. To determine whether this increase was accidental or really was subject to the movements of the sun, he commenced a series of experiments about the winter solstice, and continued them till nearly the time of the summer solstice, the period thus including all the variations on the time of the sun's rising. The result of these experiments was, that the increase always uniformly occurred soon after the commencement of twilight and before sunrise, and the increase was greatest and most remarkable when the nights were longest, and that it gradually became less as the nights grew shorter. He allows that this may have been chiefly owing to a diminution having taken place in the usual minimum quantity towards morning, either probably from the fatigue of watching or from drowsiness.

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* Observations on the quantity of carbonic acid gas emitted from the lungs during respiration. at different times and under different circumstances. By William Prout, M.D., of the College of Physicians. Annals of Philosophy, vol. ii., p. 328. November 1813.

The time of the evening diminution appears to be about the termination of twilight and the commencement of darkness. Dr Prout infers, from various facts, that Law I., given in the first paper, requires to be modified, and, instead of the periods there mentioned, 8 h. 30 m. P. M., and 3 h. 30 m. A. M., as the commencement and termination of the minimum, he substitutes the words, the ending and beginning of twilight.

In the second division of the investigation, the object of which was to determine the respective influence of modes of diet, and various alimentary, medicinal, and other physical agents, Dr Prout found his former inferences very generally corroborated by the experiments of Dr Andrew Fyfe, which had been made known in the interval subsequent to the first experiments of Dr Prout.

Dr Fyfe fixed the standard quantity of carbonic acid gas emitted from his own lungs under ordinary circumstances of health at about 8·5 per cent.

1. We found that, under the use of vegetable diet, this was reduced to about 4·5 per cent. Dr Prout found, that, on the seventh and eighth days of vegetable diet, the same amount of reduction took place.

2. The effects of animal diet, Dr Fyfe found to be various. Dr Prout found, that on the fourth day of diet with animal matters, the quantity of carbonic acid was 7 per cent., on the seventh and eighth days, 5 per cent.

3. Under the use of wine, Dr Fyfe found the quantity of carbonic acid reduced to between 2 and 3 per cent., and, in one experiment, to only 5·5 per cent. The experiments of Dr Fyfe were not made till the day after the use of wine. Those of Dr Prout were made immediately, and while the first effects were present.

4. Under the use of mercury, Dr Fyfe observed a reduction to about 3 per cent. Dr Prout observed a considerable diminution, varying from 2·80 per cent. to 4·5. The diminution, nevertheless, though perfectly real, was not often so great as that observed by Dr Fyfe.

5. Under the use of nitric acid, Dr Fyfe observed a reduction of between 6 and 7 per cent. Dr Prout appears not to have made trial of the effects of this acid.

The paper is concluded by the following general observations, which must be studied in forming any estimate of the accuracy of these experiments.

"With respect to the numbers here brought forward, as well as those in my former paper, I wish it to be distinctly understood that they do not represent the measures of the quantity of carbonic acid emitted *in* any given time from the lungs, but the measures of the power or capability of the lungs *at* any given time, to form or throw off carbonic acid. This was not so distinctly pointed out in my former communication as it ought to have been. What I mean, then, to say is this, that the *power* or *capability* of the lungs for forming and throwing off carbonic acid is *greater* at noon, &c.; and not that a greater quantity of it *is actually thrown off* at that time than at any other. A greater quantity will indeed be thrown off, *cæteris paribus*, on an equal number of similar respirations being made in the same given time. But whether this be really the case or not, I cannot pretend to determine.

"If the hypothesis which was formerly advanced be founded in truth, it is evident that we have in these numbers a sort of relative measure of the degree of energy of the nervous system; but whether it be a measure of the energy of this system as it operates through the medium of the blood, or the muscular apparatus of circulation or respiration, or partly on all the three, I am unable to decide; that is to say, I do not precisely know whether the changes under consideration are to be ascribed to differences in the state of the blood itself, or to differences in the state of circulation or respiration. Perhaps all these causes may contribute in some degree to produce them.

"It is true that Dr Fyfe did not observe at all these diurnal variations. But this has little or no weight, when the apparatus he employed is considered; since it was incapable of showing it, or at least the variations would be so extremely small that they would most likely escape observation. For my own part, I do not consider either my own experiments or his entirely conclusive on any one point. This is a thing that can hardly be settled by one or two observers. Indeed nothing but the striking uniformity that has occurred to me, and the little probability at present of my being able to repeat them in a less exceptionable manner, added to my wish of correcting as above what I formerly advanced, would have induced me to submit these observations to the world. Hence I content myself with little more than stating matters as I have found them, still waiving all speculations, however interesting they may be, till the matter has been thoroughly investigated, or at least much better examined into, either by myself or others."

The papers of which an account is here given may be regarded as examples of that species of scientific and chemical inquiry for which Dr Prout showed peculiar aptitude. And we shall see that in no long time he placed before the chemical and physiological world unequivocal and valuable evidences of the manner in which his hours were at that time occupied.

Meanwhile the year 1814, in which the second of these papers appeared, was a period pregnant with important events in the life of Dr Prout. On the 10th of May he was admitted a fellow of the Medico-Chirurgical Society at the same time with Dr Henry Holland. He took up his residence in Southampton Street, Bloomsbury, commencing the career of a practical and consulting physician. Another important event in this year of his life was, that he entered into the matrimonial state with the eldest daughter of Dr Alexander Adam, of Edinburgh, to whom it has been mentioned Dr Prout was introduced in 1808 by his friend Dr Jones, of Redland.

Besides a taste for mechanics and for music, Dr Prout possessed a peculiar turn for painting, and had already acquired considerable skill in judging of the merits of productions of the pencil. This taste he had an opportunity of gratifying the same year in the course of a visit which he made to Paris during the short interval of peace which preceded the escape of Napoleon from the Island of Elba. He there had the means of rectifying and enlarging his ideas in this art, by studying the works of the great masters in the galleries of the Louvre.

In the course of the subsequent year, 1815, Dr Prout occupied much of his time in prosecuting the science which was now his favourite. He gave in February an account of the chemical constitution of the sap in the vine.* In June he examined chemically the excrements of the *boa constrictor*;† the *liquor amnii* of the cow;‡ and the colouring matter in the ink of the cuttle fish;§ and in October of the same year he published Observations on the Analysis of Organic Substances.‖

The sap of the vine Dr Prout found to contain lime in considerable quantity held in solution by carbonic acid and acetic acid, and some potass; and he infers that between lime and the saccharine principle there is a relation much closer and stronger than is commonly imagined to exist.

The excrements of the *boa constrictor* Dr Prout found to contain a large quantity of uric acid, at least 90 per cent. combined with a small quantity of potash and ammonia, and some animal matter. This was the first time that uric acid had been shown to be formed by this class of animals. It had been previously shown by Fourcroy, Vauquelin, and Klaproth, that a large quantity of it was formed in the excrements of birds called GUANO, says Berzelius, brought from the South Sea Islands; and Dr Wollaston found that birds produce more of this principle when fed on animal matters. This is the first time, perhaps, that the term GUANO is mentioned as the name for the excrements of birds.* It is now known that birds, and especially sea birds, which feed almost entirely on animal matters, as well as reptiles, discharge excrements which contain principally uric acid, with a small proportion of ammonia. But as the guano or sea-fowl excrement consists of urate of ammonia, it is not improbable that the uric acid undergoes elementary decomposition, and is converted into urate of ammonia. One of the conditions of its preservation is great dryness of the atmosphere; for in islands in the northern or southern extra-tropical latitudes, it either does not occur, or is not preserved in sufficient purity and strength for agricultural purposes. Dr Prout was at that time inclined to ask, whether the conversion of the food of the boa constrictor into uric acid might not depend upon the unnatural state in which the animal is kept. It is now known that the normal excrement of this class of animals consists principally of uric acid.

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* Annals of Philosophy, Vol. v., p. 109. London, Feb. 1815.

† Ibid. p. 413. June 1815.

‡ Ibid. p. 416. § Ibid. p. 417.

‖ Ibid. Vol. vi., p. 269. London, October 1815.

At a subsequent period, namely, in 1818, Dr John Davy announced, that in the different species of serpents which his residence in Ceylon furnished him the means of examining the solid urine, which is contained in the cloacae of these animals, or is expelled from them, he found it in at least eight instances to be nearly pure uric acid. In four different species of lizards the urinary secretion was in like manner nearly pure uric acid. In the alligator this uric acid contained also, or was mixed with, a large proportion of, carbonate or phosphate of lime. The same observer found in the receptacles of the turtle and the tortoise flakes of pure uric acid, though in no great abundance,† Several years subsequently, namely, in 1823, Professor Pfaff found that the excrement of the boa constrictor contains ammonia in so great excess that it might be called a sub-urate of ammonia.‡

The ink or colouring matter of the cuttle-fish Dr Prout shows to be a peculiar species of animal black colouring matter in large quantity (78 per cent.) probably animal charcoal, with carbonate of lime and carbonate of magnesia in considerable amount, and a small proportion of muriate and sulphate of soda.

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* A View of the Progress and Present State of Animal Chemistry. By Jons Jacob Berzelius, p. 103.

† On the Urinary Organs and Secretions of some of the Amphibia. By John Davy, M.D., F.R.S.; read April 2d, 1818. Philosophical Transactions for 1818, p. 303. London, 1818.

‡ Annals of Philosophy, New Series, vol. sixth, p. 74. 1823.

Dr Prout, however, was by nature a man destined to look for general results; and all his labours on individual facts and classes of facts tended to this termination. At this time it happened that chemical knowledge was in such a state that little could be done to improve and render it precise without the aid of some general principles. The beautiful theory promulgated by Mr Dalton had hitherto numbered but few adherents; and though Thomas Thomson, Berzelius, and other leading chemists had in different modes signified their views in favour of the doctrine, it was either regarded as too fine for daily use, and considered as a thing more to be admired than trusted, or it was conceived to be so difficult to admit of demonstration, that the idea of applying it to chemistry, as then studied, was scarcely entertained or entertained by few. Berzelius had, indeed, made one of the strongest defences of the doctrine in 1814, by his Experiments to determine the Definite Proportions in which the Elements of Organic Nature are combined,* and showed that if it was admissible in explaining the chemical actions in inorganic bodies, it was equally so in explaining the chemical actions in the class of organized bodies. He had also, though differing from the theory of Dalton, given by numerous accurate experiments, the strongest confirmation of the correctness of the doctrine, that bodies unite in certain definite proportions, according to volume. It seems now only wonderful that the doctrine of definite proportions could have been so long neglected and disregarded.

Dr Prout began to elucidate the difficulties and explain the applications of this doctrine by the memoir already mentioned as published in October 1815. This paper was altogether of a general nature, and the author's object was principally to show in what manner the subject should be studied, and with what apparatus the proper experiments ought to be performed.

In November 1815, there appeared in the Annals of Philosophy a Memoir or Essay on the Relation between the Specific Gravities of Bodies in their Gaseous State and the Weights of their Atoms. The paper is anonymous; and the author states at the outset, that he submits it to the public with the greatest diffidence; for, though he had taken the utmost pains to arrive at the truth, yet he had not, he adds, that confidence in his abilities as an experimentalist which would induce him to dictate to others. The paper is short; but it contains most important and valuable matter. The author was Dr Prout. This was acknowledged in 1817 in the eighth volume of the Medico-Chirurgical Transactions. He traces with great ingenuity the relation subsisting between the specific gravities of oxygen and azote, hydrogen, chlorine, iodine, carbon, sulphur, phosphorus, calcium, sodium, iron, zink, potassium and barium, and the weight of their atoms; and gives the results in three tables, with various results calculated from analogy in a fourth table. This may be regarded as the first successful or intelligible attempt to present the chemical constitution of various substances in exact numbers of their constituent and integral elements. The general conclusions are the following.

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* Annals of Philosophy, vol. fourth, p. 323 and 401; vol. fifth, pp. 93, 174, 260.

" On a general view of the tables we may notice,

" 1. That all the elementary numbers, hydrogen being considered as 1, are divisible by 4, except carbon, azote, and barytium, and these are divisible by 2, appearing therefore to indicate that they are modified by a higher number than that of unity or hydrogen. Is the other number 16 or oxygen? And are all substances compounded of these two elements?

" 2. That oxygen does not appear to enter into a compound in the ratio of two volumes or four atoms.

" 3. That all gases, after having been dried as much as possible, still contain water, the quantity of which, supposing the present views are correct, may be ascertained with the greatest accuracy.

" Others might doubtless be mentioned; but I submit the matter for the present to the consideration of the chemical world."*

In this paper Dr Prout considers atmospheric air as a chemical compound of one volume of oxygen and four volumes of azote, or of one atom of oxygen and two atoms of azote. His method of determining the specific gravity of hydrogen from that of ammonia is original and ingenious, and was admitted in general to be well founded. It was soon adopted by Thomson, by Henry, and by Edward Turner.

This paper, if not the most popular of the day, was decidedly the most original and important; and the most philosophical chemists looked upon it as a highly valuable essay, disclosing views which, if carried into effect, might alter entirely the whole body of chemical knowledge. Dr Thomson himself expressed the highest opinion of it; and, after the lapse of five years, spoke of the author (1820) as one to whom, " if he persevered in the course which he had begun, the science of chemistry would be indebted for discoveries of a far higher and more important kind than had yet been made."†

In the next paper which Dr Prout published, the truth of the principles which he had established was well exemplified. This was in his two memoirs on the Nature of some of the proximate Principles of the Urine, with a few Remarks upon the means of preventing those diseases connected with a morbid state of that fluid in the eighth volume of the Transactions of the Medico-Chirurgical Society;[*] and further observations on the proximate principles of the urine in the ninth volume of the same work.

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* Annals of Philosophy, vol. sixth, p. 321, and vol. seventh, p. 111. The last contains the correction of an error in the first paper.

† Ibid. vol. sixteenth, p. 167. 1820.

In these memoirs Dr Prout examines successively urea, saccharine matter, lithic or uric acid, albumen, oxalic acid, cystic oxide, purpuric acid, and the pink sediment. These two papers afford beautiful and interesting examples of accurate chemical analysis, and the happy application of the doctrine of union in definite portions. Dr Prout had employed in the analysis of the animal substances the black oxyde of copper after the example of Gay-Lussac. By means of this metallic salt, combined with carefully weighing the substances produced, and accurate calculation, Dr Prout was enabled to present to the chemical and physiological world the first accurate quantitative analysis of the ultimate principles of several important animal substances. The following table presents in a short view the results of many experiments and much accurate labour.[*]

100 parts contain	Hydrogen.	Carbon.	Oxygen.	Azote.	Weight of atom.	Sugar being 1.
Sugar	6·66	40·00	53·33	—	18·75	1
Urea............	6·66	20·00	26·66	46·66	37·5	2
Lithic Acid ..	2·22	40·00	26 66	31·11	56·25	3
Cystic Oxide ...	5·00	30·00	53·33	11·66	75·00	4
Oxalic Acid ...	4·44	20·00	75·55	—	112·5	6
Albumen	7·77	50·00	26·66	1555	112·5	6

The general conclusions which Dr Prout felt that he was entitled to deduce from the series of experimental investigations now mentioned show how far he had at this time advanced in forming views at once sound and ingenious on the chemical constituents of substances produced by organized bodies.

"1. The atomic theory or theory of definite proportions holds good in all these instances;—a circumstance which renders it probable, that this will afterwards be found to be the case in all substances capable of crystallizing or forming crystalline compounds, both in the vegetable and animal kingdoms.

"2. The above compounds appear to be formed by the union of more simple compounds, as urea of carburetted hydrogen and nitrous oxide, lithic acid of cyanogen and water, &c., circumstances which render it almost certain that their artificial formation falls within the limits of common chemistry.

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[*] Observations, &c., By William Prout, M.D Read June 24th, 1817. Medico-Chirurgical Transactions, vol. eighth. London, 1817, p. 526. And; Further Observations. Read June 24th, 1818. Medico-Chirurgical Transactions, vol. ninth, p. 472. London, 1818.

"3. The remarkable relation found to subsist between urea and sugar, seems to explain in a very satisfactory manner the phenomena of diabetes, which may in fact be considered to consist in a depraved secretion of urea. Thus the weight of the atom of sugar *is just half* that of urea: the *absolute quantity of hydrogen* in a given weight of both *is equal,* while the *absolute quantities* of carbon and oxygen in a given weight of sugar are precisely *twice* those in urea.

"4. Lithic acid is a substance quite distinct from urea in its composition;—a fact which explains an observation I have often made, that an excess of urea generally accompanies the phosphoric diathesis, and not the lithic. I have several times seen urea so abundant in the urine of a person where the phosphoric diathesis prevailed, as to crystallize spontaneously without being concentrated by evaporation, on the addition of nitric acid."

In these few sentences, indeed, and in the small table here given, Dr Prout had embodied facts and principles most important, the result of long continued careful labour, and which were calculated, as the result has since proved, to throw on the nature of chemical actions and chemical unions a light altogether new.

It is farther a circumstance deserving of serious attention, that Dr Prout was not in this inquiry led away, by his chemical prepossessions, to adopt views of the superior and predominant importance of the chemical treatment of urinary disorders. It is a remarkable proof of the sober, judicious, and well tempered character of the mind of Dr Prout, that he not only refrains from all commendation of remedies, chiefly chemical, such as acids and alkalies, but allows that these remedies may be often hurtful; that they are not useful, unless in so far as they amend and improve the general health; and he adds, what ought never to be forgotten, however humbling it may be, that "the object of the chemical practitioner is at best but of a secondary description, namely, to prevent the effects of disease rather than to remove it." How correct and how well founded were the views of Dr Prout on this subject in 1817, those most engaged in medical practice can tell after the lapse of thirty-four years.

Meanwhile, Dr Prout continued assiduous in availing himself of all opportunities of investigating the state of the urine and its ingredients, and observing the influence of morbid conditions in modifying these ingredients. Between the time of the communication of the first Memoir to the Medical and Chirurgical Society and that of the second, Dr Prout made the discovery of a new acid principle obtained from the uric acid. Of this principle the description was communicated by the author on the 11th of June 1818 to the Royal Society through the medium of Dr Wollaston.

This acid principle was the Purpuric Acid, a name, he informs us, suggested by Dr Wollaston, in consequence of its property of forming with most bases compounds of a red or purple colour.

It was known that, when lithic acid is digested in pure nitric acid, effervescence takes place, and the lithic acid is dissolved, while there is formed a substance which is known to be purpurate of ammonia, or the new acid united with ammonia.

In the ordinary way of preparation the excess of nitric acid is neutralized by means of ammonia, and the whole is slowly concentrated by evaporation. As evaporation proceeds, the solution acquires a deep purple colour, and dark red granular crystals are separated in abundance. These crystals are purpurate of ammonia; and when the alkali is removed by means of sulphuric or muriatic acid, the purpuric acid is obtained in a separate state.

Of this acid and its combinations with the metallic and metalloid bases Dr Prout gave a full and satisfactory account. He thinks that the purpuric acid and its compounds probably constitute the bases of many animal and vegetable colours. The pink sediment, which so generally appears in the urine of persons labouring under febrile and inflammatory states of the system, is known to owe its colour chiefly to the presence of purpurate of ammonia, and perhaps occasionally of purpurate of soda.*

The reception of the memoir on purpuric acid was every where favourable in this country. Indeed the known accuracy and ingenuity of Dr Prout were sufficient to insure, at least, a patient hearing to his facts and their results, because no one but a chemist equal or superior to himself was capable of forming and pronouncing any judgment upon their merits. Vauquelin alone was disposed to call in question their correctness. He stated that he could not procure purpuric acid from uric acid by the method recommended or any method; and he represented Dr Prout as a mere repeater of the experiments of Signor Brugnatelli, who had indeed obtained from lithic acid treated by nitric acid an acid principle to which he applied the name of erythric acid. It was impossible, however, that Dr Prout could be merely the repeater of the experiments of Brugnatelli; for the memoir of Dr Prout was read to the Royal Society on the 11th of June 1818; and the experiments must have been performed some weeks if not months previously; whereas the translation of the paper of Brugnatelli appeared in the Philosophical Magazine early in July 1818, and the original memoir, which had not been seen by Dr Prout at all, had appeared in the *Giornale di Fisica* for January, February, March, and April 1818. The crystals called erythric acid have been generally admitted to be merely a mixture of nitric and purpuric acid, or a quadruple salt formed by the union of supernitrate and superpurpurate of ammonia.

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* Description of an Acid Principle prepared from the Lithic or Uric Acid. By William Prout, M.D. Communicated by W. Hyde Wollaston, M.D., F.R.S. Philosophical Transactions, 1818, vol. liv. p. 420.

The main reason why Vauquelin was unable to obtain purpuric acid was that he operated probably on an impure lithic acid. Dr Prout used to prepare it from the pure uric acid furnished by the excrements of the *boa constrictor*. Dr Prout afterwards transmitted to M. Vauquelin, as the least equivocal mode of proving the accuracy of his researches, a small quantity of purpuric acid, purpurate of ammonia, and pure lithic acid.*

The correctness of the results obtained by Dr Prout has since been admitted by all good chemists, and purpuric acid is regarded as no longer apocryphal.

It must nevertheless be admitted, that, upon the nature of the substance described by Dr Prout as Purpuric Acid, the opinions of chemists have undergone a considerable change. To the matter which forms purple and pink-coloured unions with ammonia and other bases recent authors have applied the denomination of Purpurine.

It ought to have required, in the circumstances of Dr Prout, but a moderate exercise of patience and self-denial, to endure the scepticism of M. Vauquelin. Some months afterwards, Dr Prout was proposed, on the 10th of December 1818, as candidate for admission to the Royal Society, in whose Transactions the paper was published. The recommendation was signed by Alexander Marcet, William Hyde Wollaston, Henry Warburton, Charles Koenig, P. M. Roget, H. Leigh Thomas, Sir Gilbert Blane, and Matthew Baillie, several of whom were not likely to risk their reputation, or the respectability of the Society, by proposing one not in every respect worthy; and, though it was unusual to do so, the paper on purpuric acid was mentioned in the note of recommendation. Dr Prout was accordingly elected on the 11th of March 1819; and it cannot be doubted that rarely was any election effected so completely upon the scientific merits of the candidate.

The course of the narrative has led to anticipation, in order that the account of the discovery of purpuric acid might be completed. We have again to return to the chronological order.

In January and April 1819 Dr Prout published in the thirteenth volume of the Annals of Philosophy his researches on the Phenomena of Sanguification and on the Blood in general. Part of this paper had previously appeared under the title of an Inquiry into the Origin and Properties of the Blood; but as the paper was not completed, and as the work in which it was inserted had a very limited circulation, the author thought it most expedient to publish the whole in a condensed and corrected form.*

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* Some Observations on the Action of Nitric Acid on Lithic or Uric Acid, in reply to M. Vauquelin, by William Prout, M.D., F.R.S., &c. Annals of Philosophy, vol. fourteenth, p. 363.

In order to communicate correct ideas on the nature of the blood and the process of sanguification, Dr Prout begins by taking a view of the process of digestion, and the changes which alimentary articles undergo in different divisions of the alimentary canal. This he does by examining the process of digestion experimentally in different animals,—the rabbit, the pigeon, and turkey, the trout and mackarel. He gives a comparative view of the characters of chyme derived from vegetable and that derived from animal food, in order to determine the point at which albuminous matter is formed. He next examines and describes the characters of chyle, then traces the process into the blood-vessels, and considers the phenomena of sanguification.†

Though this paper has been in a great degree superseded, partly by the subsequent researches of Dr Prout himself, partly by those of Tiedemann and Gmelin in their Treatise on Digestion examined Experimentally, and subsequently by those of Beaumont, it nevertheless contains several facts, in which may be recognized the germs of that more accurate and perfect knowledge which has since that time been acquired by different observers on the subject of digestion. All the material information communicated in it was subsequently embodied in the preliminary discourse of the third edition of the Treatise on Stomach and Urinary Diseases.

At this time, Dr Prout being well known as a skilful and accurate analytical chemist, enjoyed frequent opportunities of exercising his talents and extending the boundaries of chemical science in this manner. One of the first of these, was the Description of an Urinary Calculus composed of Urate of Ammonia, which the author communicated to the Medico-Chirurgical Society on the 22d of June 1819.

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* The work here referred to as containing the original sketch of the Memoir on the Phenomena of Sanguification is the Annals of Medicine and Surgery; or Records of the occurring Improvements and Discoveries in Medicine and Surgery and the immediately connected Arts and Sciences, vol. i., London, pp. 18, 433, and 277. This was a periodical Journal published at London, during 1816 and 1817 quarterly, in March, June, September and December. It contained original communications, reviews, and notices of newly published works, and notices of lectures, hospitals, hospital officers, and similar matters interesting to the profession. It appears not to have proceeded farther than eight numbers or two volumes; at least we have not seen more. The Memoir of Dr Prout is contained in the first volume in the numbers for March, June, and September 1816, and ought probably in the text to have been noticed as published in the course of that year. As, however, the author regarded the paper in that form as incomplete, and as it appeared in an improved and condensed shape in 1819 in the Annals of Philosophy, it has been thought most eligible to notice the memoir as in 1819.

It has been said that this journal was conducted by Dr Elliotson and Dr Prout; but the correctness of this statement we have no means of ascertaining.

The first volume of the Annals of Medicine and Surgery is inscribed in a Latin dedication to Matthew Baillie, M.D., London; the second volume, in the same language, to James Hamilton, M.D., Edinburgh, at that time Physician to the Royal Infirmary.

† On the Phenomena of Sanguification and on the Blood in General. By William Prout, M.D. Annals of Philosophy, vol. xiii., pp. 12 and 265.

It had been generally believed that urate of ammonia either did not occur in concretions, or was an occurrence of extreme rarity. It is indeed a chemico-physiological fact, that urate of ammonia is in the urine a very soluble salt, and that it forms one of the means of conveying out of the system uric acid. Mr Cline, Junior, however, had extracted from a boy of two years, in St Thomas' Hospital, in April 1819, a concretion weighing about fifty grains, of a wax yellow colour, and which, from being slightly soluble in cold water, and readily dissolved in boiling water, seemed to be composed of urate of ammonia. In solutions of the fixed alkalis it was also readily dissolved, exhaling at the same time a strong smell of ammonia. When to this solution muriatic acid was added, lithic acid was precipitated. In nitric acid it was readily dissolved, exhibiting with that agent the same phenomena as lithic acid. Muriatic acid, in which it was digested, was converted into muriate of ammonia.

These facts were sufficient to show that this concretion consisted chiefly of urate of ammonia. Between the layers, however, of the urates were deposited minute portions of the earthy phosphates.

The boy, from whom this concretion was extracted, suffered symptoms of extreme irritation, and the general health was greatly disordered. Similar facts, Dr Prout mentions, had occurred in the case of another boy, from whom a concretion of the same composition had been extracted. Dr Prout inferred, consequently, that the concretion in its pure state is peculiar to children under the age of puberty, and that its presence is attended by great derangement of the general health, and symptoms of much general irritation.*

In September of the same year, Dr Prout gave the analysis of some concretions discharged by coughing, and showed that they consisted chiefly of phosphate of lime, with some carbonate of lime, united by a cement of animal matter, which retained the shape and size of the concretion after the earthy matter had been removed by an acid. He examined also the earthy or bony-like matter discharged from a wen, and found it to contain of

Animal matter and water, - - -	35
Phosphate of lime, - - - -	61
Carbonate of lime with traces of phosphate and carbonate of magnesia, - - -	4
	in 100 parts.

This is about 10 per cent. more phosphate of lime than human bone contains, (51.14.) 8 per cent less of carbonate of lime and phosphate of magnesia, (12.46), and 2.3 per cent. more of animal matter than is found in bone, (33.3.) The morbid concretion, further, was void of fluate of lime.[*]

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* Medico-Chirurgical Transactions, vol. Tenth, p 389. London, 1819.

Lastly, in December of the same year, Dr Prout gave the account of a case of spontaneous ptyalism in a female upwards of sixty years of age, in whom the urinary secretion was remarkably diminished. Analysis showed this saliva to contain the following articles:—

Animal matter not albuminous,	3.33
Animal matter soluble in alkohol, and apparently similar to those usually existing in the blood,	1.06
Sulphuric acid,	0.90
Muriatic acid,	0.75
Phosphoric acid,	0.06
Alkaline matter, consisting partly of soda and partly of potash.	2.55
	8.65

The alkaline substances were not neutralized by the acids; and as the saliva had to the patient a urinous taste, Dr Prout infers that this was probably caused by the presence of the alkalies. The specific gravity of this patient's urine was 1013.1. It contained crystals of uric acid, and reddened litmus paper more strongly than usual. It contained much less urea than natural, but a large proportion of a brown animal substance, which appeared to render it very prone to decomposition, especially when exposed to heat.

The patient was under the care of Dr Elliotson of St Thomas's Hospital. Under the use of diuretics, the symptoms subsided.[†]

Dr Prout expresses the opinion that cases of this nature may have been mistaken for discharges of urine from the mouth. The patient was in the belief, that the fluid came from the stomach, and was of a urinous nature. She had previously laboured under similar attacks; but these were less severe, and after some time had ceased spontaneously.

In June 1820, Dr Prout examined the excrements or urinary secretions of the *Chamaeleon Vulgaris;* and found them to consist, like the urinary excrement of the *Boa Constrictor* and lizard tribe, chiefly of lithic acid with ammonia. In this manner were reduced to general principles the several facts that birds, serpents, and several of the reptile tribes, discharge urine consisting chiefly of lithic acid with ammonia, or lithate of ammonia.[‡]

In August of the same year, he made known other three chemical facts of some importance. The first was that pure potash, which had been known to contain a minute quantity of some metal, generally contains an oxide either of silver, of lead, sometimes of iron, and sometimes of copper. The presence of one or other of these metals he observed, even in minute quantity, may have often misled chemists in experiments, especially upon potash, and perhaps, also, in pure soda. He cautions chemists, therefore, against drawing decided inferences from the part of a black colour being produced by the addition of sulphuretted hydrogen when operating on the alkalis.[*]

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[*] Annals of Philosophy, Volume Fourteenth, p. 233. London, 1819.

[†] Ibid. Ibid. p. 474. December 1819.

[‡] Ibid. New Series. Volume First, p. 427. June 1821.

The next fact was the recognition of urea in the urine of the horse, in which that principle had been supposed not to be present. He found in treating the urine of the horse with nitric acid that the quantity of urea was unusually large. To insure the success of the experiment, he recommends that the urine of this animal be operated upon while still warm; or if this be not practicable or convenient, that a few drops of some acid, the muriatic being preferable, be put into the vessel in which the urine is received and intended to be kept. This acid by neutralizing the lime, which is sometimes most abundant, prevents it from acting on and decomposing the urea.[†] In ordinary circumstances the urea is speedily converted into ammonia.

The fluid of hydrocephalus, taken from the head of a child ten years of age, who had died of the disease, Dr Prout found to contain the following substances[‡] which are here given along with the results previously obtained by Dr Bostock.

Dr Prout.		Dr Bostock.	
Water, .	987·18		986·0
Albumen precipitated by nitric acid and heat,	1·66	Albumen, .	1·2
Substances soluble in alcohol, viz., adipocerous matter, lactate of soda, .	1·5	Uncoagulable matter,[§]	2·8
Mur. potash and soda, 6·80, sulph. soda and animal matter, 2·71,	9·51	Salts, chiefly muriate of soda, .	10·0
	1000		1000

Hence this fluid is remarkable for the quantity of muriates which it contains. It also contains albumen, though not a great proportion.

Amidst all the difficult scientific researches, on which it has been seen Dr Prout was for several years engaged, he did not neglect the great object of arranging and methodizing the new facts which his assiduous study of the digestive and urinary functions were from time to time bringing to light. The time was, indeed, now arrived, when he believed that it was possible to place before the profession, in a systematic and consecutive form, the results of his experimental inquiries and observations. Accordingly, in December 1820, he published his Inquiry into the Nature and Treatment of Gravel, Calculus, and other Diseases connected with a deranged Operation of the Urinary Organs. The volume was not large, consisting only of two hundred and twenty-seven pages octavo. But the amount of new, and especially of accurate information which it contained, was such as had not been seen for many years in any work of similar size.* It is not in this Journal that invidious comparisons are drawn between the productions of authors, who write to elucidate the same or similar and kindred subjects. All comparisons of this kind must be regarded as derogatory to true science, and little creditable to those by whom they are made. There was, however, no work between which and that of Dr Prout any comparison could be instituted. The treatise of Dr Marcet, which appeared in 1817, was only on one division of the subject; and on the subject contemplated more in a chemical than a physiological light. Every one admired the neatness and accuracy of the distinctions given by Dr Marcet; and every one felt what a valuable contribution that intelligent physician had made to the history and medical treatment of calculous diseases. The treatise of Dr Marcet was further important and most serviceable in directing the minds of practitioners to the proper treatment of this class of disorders; and it must always be looked upon as a valuable work on the history of the medical treatment of urinary concretions.

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[*] Annals of Philosophy, Vol. Fifteenth, p. 471. June 1820.

[†] Ibid., Vol. Sixteenth, p. 150. August 1820.

[‡] Ibid. ibid

[§] Ibid. p. 151.

The work of Dr Prout, small as it was, was upon a plan more comprehensive. It embraced all that had been so ably accomplished by Dr Marcet, and by presenting those topics which came not within the plan of Dr Marcet, but which, nevertheless, formed important integral branches of the whole subject of diseases of the urinary secretion, it gave a complete view, though principally in outline, of all the derangements to which that important secretion is liable, and all those morbid conditions of the system of which these derangements are at once effects and indications.

In another respect, the treatise by Dr Prout was to the practical physician most serviceable and instructive. It had been long known, at least since the time of the first publication of the anonymous treatise of Murray Forbes in 1786, that various dynamic disorders of the digestive organs and various derangements in the process of digestion, exercised a very powerful influence upon the secretion of the kidneys; and various practitioners, such as Sir

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* The date of the preface is 12th December 1820.

Gilbert Blane, Mr Abernethy, Mr Parkinson, Dr Wilson Philip, Dr Scudamore and others, had applied this knowledge to practice. This knowledge, nevertheless, was without shape, form, or general system. Dr Prout, by giving more clear and more minute and accurate views of the assimilative process, primary and secondary, than physicians had yet been able to obtain, and by tracing the effect of derangement of these processes, in disturbing the normal conditions of the urinary secretion, if he did not create a new species of physiological-pathological knowledge, certainly had the merit of completing the outlines of a picture which was previously meagre and unintelligible. The inquiry of Dr Prout, in short, introduced clearness and order, where previously little but obscurity and confusion prevailed, and gave connection to many scattered and isolated facts, and precision to many that were previously loose and vague.

The work was, nevertheless, presented to the profession as a mere outline of the subject, to be expanded and rectified by subsequent experience.

The inquiry of Dr Prout when it appeared in the beginning of 1821, consisted of an introduction, general observations, and two sections or general divisions.

In the introduction the author gave a view of the principles of the blood and of the urine, and drew a sort of contrast and comparison between them, in order to point out the relations between the blood and the urinary secretion.

The first section of the Inquiry, on diseases in which principles soluble in the urine are morbidly deranged in quantity or quality, was subdivided into three chapters, in which the author treated successively;—1. Of diseases in which the presence of an albuminous principle is the characteristic symptom; 2. Diseases in which an excess of urea is the characteristic symptom; and 3. On diabetes.

The second section, on diseases of the urine, in which principles insoluble in that secretion are morbidly deranged in quantity or quality, was subdivided into seven chapters, devoted to the consideration of the following subjects:—

1. Description of urinary gravel and calculi, with a summary account of their chemical composition, &c.

2. Data showing the comparative prevalence of the different forms of urinary deposits, and the order of their succession. Observations founded on these data, illustrative of the general pathology of urinary deposits.

3. On the lithic acid diathesis in general; and on the best modes of counteracting it, so as to prevent the original formation of calculus, or its recurrence after an operation.

4. On the oxalate of lime, and cystic oxyde diathesis.

5. On the phosphatic or alkaline diathesis.

6. On the modes of formation and future increase of calculi. On the symptoms produced by the different varietes in different

situations, and on the medical treatment to be adopted when they are lodged in different situations.

7. General observations on the periods of life, sex, climate, &c., most subject to calculous affections. On the mortality attending the operation of lithotomy, with observations on the circumstances in which it might or ought not to be recommended.

In this second section, the second, third, and seventh chapters, contained a large amount of new, accurate, and interesting information on the circumstances of diet and mode of life, which favoured the deposition of gravel and urinary concretions; and to the matter of these chapters may be traced a large proportion of that rational and well founded physiological information which physicians in the present day possess on the pathology and treatment of diseases, in which the urinary secretion is deranged, either as cause or as effect, as part, or as symptom.

Dr Prout had in describing the different sediments or deposits taking place in the urine seen reason to distinguish them into three general orders; the yellow, the red or lateritious, and the pink sediments. As these distinctions are important, he endeavours to convey to the reader some idea of them, by giving coloured representations of the leading tints, where these different orders of sediments assume. This is the first attempt to convey in this manner correct ideas on the distinctive characters of these sediments.

One statement relating to an estimate of the mortality by the operation of lithotomy was called in question by the late Dr Yelloly. From an examination of the number of deaths after the operation of lithotomy in the Bristol Infirmary, the Leeds Hospital, and the Norfolk and Norwich Infirmary, Dr Prout represented the mean rates of mortality after lithotomy, at all ages, all over the kingdom, to be 1 in $7\frac{3}{4}$ nearly. Dr Yelloly, on the other hand, saw reason, from careful investigation of the registers of the Norfolk and Norwich Hospital, up to the year 1816, combined with the rates furnished by the Bristol Infirmary and the Leeds Hospital, to conclude that the average mortality, as inferred by Dr Prout, ought to be about 1 in $6\frac{1}{2}$, instead of 1 in $7\frac{3}{4}$.*

In his reply which appeared in the same Journal the following month, Dr Prout answers;—that the representation was not inadvertent, but intentional; that in point of fact, the actual numbers did lead to the estimate given by Dr Yelloly of 1 in $6\frac{1}{2}$; but that this estimate, when all circumstances were duly considered, seemed to exceed the truth, and that the ratio of 1 in $7\frac{3}{4}$, though deducible on general principles from the same data, is not necessarily more correct than the actual one; yet, as it coincides with the views which ought to be taken if the metropolis be included, he argues, that it is entitled to the preference. Dr Prout added, that he wished to represent the rate of mortality as it exists at that time, when he is willing, he says, to believe that the surgical art is more perfect than at any former period.*

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* Annals of Philosophy, New Series, Volume First or Seventeenth of the old, p. 363. May 1821.

On the 20th of June 1822, Dr Prout communicated to the Royal Society an important memoir on a chemico-physiological subject, on which little or nothing was hitherto known. Many inquirers had traced and described with different degrees of accuracy, the mere physiological changes which the egg undergoes during incubation, from the times of Fabricius ab Aquapendente, Harvey, Malpighi, and Haller, downwards to John Hunter and Sir Everard Home. But the chemical changes it had hitherto been impracticable to study, from the imperfect state of the means of analysis; or it was a subject on which no one had hitherto ventured to form an opinion. This subject Dr Prout had begun to study in 1816; and, though he had occasionally continued his researches as time permitted, he had been unable till 1822 to give them that degree of precision which could entitle them to be made known. The communication at this period was, nevertheless, entitled, an Account of some experiments only on the fixed principles of the egg during incubation. The principal object of the inquiry appears to have been to determine the chemical nature of the different constituents of the egg, to ascertain what chemical and physical changes they undergo during incubation, and to discover to what extent and in what manner the different chemical constituents and ingredients influence the vital actions.

With the view of obtaining information on these points, Dr Prout performed a great number and variety of experiments on the egg in its recent and unaltered state; on its saline contents; on its acquired constituents; and on its changes at different periods of the process of incubation. The results may be stated in the following general terms.

1. A moderately sized egg loses on an average in weight three-fourths of one grain in twenty-four hours; and this uniformly during a very long period. The loss appears to be somewhat greater in summer than in winter, owing, he thinks, to the difference in temperature, which varied at the time of the experiments from 40° to 70°.

2. The relative weights of the shell, albumen, and yolk of different eggs are very different. Among ten eggs in which the weight of each part was carefully taken, the average is that, if a recent egg weigh one thousand grains, the relative proportions of the shell, albumen, and egg will be as the numbers 106·9, 604·2, and 288·9.

3. When an egg is boiled in water it loses weight, particularly if it be removed from the water when boiling, and be allowed to cool in the open air. The water is found to contain a portion of

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* Annals of Philosophy, Vol. First, p. 427. June 1821.

the saline contents of the egg. The loss of weight is not constant; but varies from 20 to 30 grains, on the supposition that the original weights of the eggs employed are one thousand grains.

4. On the same supposition, it results that the quantity of saline matter obtained by evaporating to dryness the distilled water in which an egg has been boiled, amounts on an average to 32, or not quite one third of one grain. This saline residum is strongly alkaline, and yields traces of animal matter, sulphuric acid, phosphoric acid, chlorine, an alkali, lime, and magnesia, and carbonates of lime and magnesia. The carbonate of lime is generally most abundant.

5. Dr Prout thinks it probable, as Berzelius has observed, that the sulphuric acid obtained from the albumen is a product of combustion, and exists in it naturally as sulphur. The same appears to be the case, to a great extent at least, with respect to the phosphoric acid, especially that obtained from the yelk. The chlorine seems to exist originally in union with sodium, forming common salt. As to the earthy principles, Berzelius is of opinion that their metallic bases, *calcium* and *magnesium*, are probably to be considered as constituent principles of the primary animal compounds. The phosphoric acid is most abundant, especially in the yolk, being at least 3·56 grains in 1000, and amounting in the yolk and albumen together to 4 grains. The interpretation of this is that the phosphorus is the most abundant ingredient. The next abundant articles are the alkalis, potash, and soda, and their carbonates; amounting altogether to between 3.2 and 3.42 grains in 1000.

6. An egg loses during incubation about one sixth of its weight; a quantity amounting to eight times as much as it loses in the same time under ordinary circumstances.

7. In the earlier stages of incubation an interchange of principles takes place between the yolk and a portion of the albumen. This interchange is confined on the part of the yolk to a little of its oily matter which is found mixed with the above-mentioned albumen. This portion of albumen undergoes some remarkable changes, and is converted into a substance analogous in appearance, as well as in some of its properties, to the curd of milk. Lastly, a portion of the watery and saline portion of the albumen is found mixed with the yolk, which becomes thus apparently increased in size.

8. As incubation proceeds, the saline and watery parts again quit the yolk, which is thus reduced to its original bulk. In the last week of incubation, it undergoes still further diminution in weight, and loses the greater portion of its phosphorus, which is found, in the animal, converted into phosphoric acid, and mixed

with *lime*, constituting the bony skeleton. This lime, nevertheless, does not originally exsist in the recent egg, but is derived from some unknown source during the process of incubation.

It may be observed from what is stated in the seventh general proposition, that Dr Prout had anticipated the observation of Ascherson regarding the effects of the mixture of oil and albumen.* An important question is also proposed as to the uses of the saline matters, concerning which he acknowledges little is known. The question is, do they perform an office in the animal economy analogous to acid solutions in the galvanic battery? To this question, which contains the germ of one of the doctrines employed by Professor Liebig, we may subsequently direct attention.

The great use of the yolk, according to Dr Prout, is to furnish phosphorus, which, in the shape of phosphoric acid is, along with lime, to form the skeleton of the young animal. He expresses confidently the opinion, nevertheless, that this lime does not pre-exist in the recent egg, certainly not in any known condition; and what is still more extraordinary, he thinks that there are very strong reasons for believing that this earthy matter is not derived from the shell. On the validity of these reasons we feel it unbecoming to offer any opinion. Dr Prout, nevertheless, does not wish to be understood to assert that the earth is not derived from the shell.†

Since the date of the publication of the memoir of Dr Prout, many inquirers have made researches on the chemical constitution of the egg and its influence on the physiological changes which take place during the process of incubation. We mention only two; Mr Alfred Taylor and M. Barreswill. The memoir of the latter author was published entire in the last volume of this Journal; and readers will perceive in it the progress that has been made in the knowledge of the chemical constituents of the egg, and the changes which they either undergo, or which the saline and other matters seem to induce.‡

Of the essay by Mr Alfred Taylor, which was published in 1848, the main object is to explain the origin or the alleged production of phosphate of lime and iron in the egg during incubation.

Sir Gilbert Blane had made the views of Dr Prout on this subject, especially that relating to the difficulty of accounting for the presence of lime in the bones of the chick, the foundation for an hypothesis, that what are denominated elementary substances are created in the animal body under the influence of the vital principle. The hypothesis was, like many others, premature, if not something rash. It is well known that since that time great advances have been made in animal chemistry, and that many phenomena, then inexplicable and little understood, now admit of more easy explanation.

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* Henle Allgemeine Anatomie. Seite 164.

† Some experiments on the changes which take place in the fixed principles of the egg during incubation. By William Prout, M.D., F.R.S.. Read June 20, 1822. Philosophical Transactions for 1822. London, p. 377.

‡ Edinburgh Med. and Surg. Journal, volume lxxv, p. 372.

Mr Taylor subjected to analysis the shell, the albumen, and the yolk, and found that not only did the shell contain animal matter, carbonate of lime in large proportion, and traces of phosphate of lime, but no iron; but that iron and phosphate of lime are constituents of the yolk and white of the newly-laid egg, as well as in that which has undergone incubation; that there is no reason to believe, that the proportions of these two principles are greater at one time than at another; that iron is contained in the albumen as well as in the yolk; and that the shell of the egg contains no iron, and but very slight traces of phosphate of lime.

Mr Taylor, in short, concludes, that the albumen or white of the egg is principally concerned in the changes which take place in forming the chick, from the fact which has been always known, that the greater part of the yolk is found entire within the body of the chick towards the last stage of incubation; and, further, that in the process there takes place, under the influence of the vital principle, no creation of alimentary matter in the egg, but a marvellous instance of the re-arrangement of the principles which the egg contains in new physical forms.*

These observations come most opportunely to preserve as it were the character of Nature for uniformity, and to show that phenomena, for the presence of which it seems at one period of scientific history difficult to account, may yet be explained at a subsequent period, without having recourse to any principle not recognized among the legitimate conditions of scientific investigation. Dr Prout, without, however, speaking very confidently, speaks of such a thing as transmutation to account for the lime and the bones of the chick. A principle so new, and, it may be added, so unrecognized in chemical action, it is not easy for the mind to admit. The explanation which, in the lapse of twenty-six years chemical analysis has been able to furnish, is most serviceable in impressing the lesson, that, in circumstances in which we are unable to explain all phenomena in living bodies, it is most prudent to wait and suspend judgment until the accumulation of further facts, either in the course of professed research or the casual progress of science, comes to give the elucidation which was previously wanted.

The next remarkable fact which Dr Prout brought to light was the occasional existence of a new acid principle, namely, the Melanic in the urine.

Dr Marcet observed, in 1802, discharged by a female patient of the City Dispensary, urine of a deep black colour.

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* On the Alleged Production of Phosphate of Lime and Iron in the Egg during Incubation. By Alfred Taylor, F.R.S. Guy's Hospital Reports, Second Series, vol. vi., Part i. October 1848, p. 141.

The patient, who was young, was subject at the time to daily accessions of symptoms partaking both of the febrile and hysterical character; and she was affected by an intermittent disorder of the integuments in particular parts of the body, the accessions of which followed and alternated with those of the febrile fit. The cutaneous disorder began with tingling of the parts, soon followed by considerable puffy swelling over an extent of several inches, lasting for hours, and ultimately succeeded by the appearance of a black or dark purple colour, which often continued for some days after the other phenomena had subsided. The seat of this disorder varied; the toes, legs, hips, and face being in succession liable to the attacks.

The whole disease lasted between two and three months. The patient was treated with Peruvian bark, which she took for weeks without benefit. Under the addition of nitrate of silver, the disorder disappeared.

It was twelve years subsequently, namely, in December 1814, before Dr Marcet had another opportunity of observing black urine. Dr Babington then showed him a phial of it, which had been voided by a male infant of seventeen months, in other respects healthy. This had been the colour of the urine almost constantly subsequent to birth.

The density of this urine was 1022.2. No red globules could be perceived by the aid of the microscope.

From chemical examination of this urine, Dr Prout inferred that it contains not any lithic acid; that no urea exists in it; that it owes its black colour to a compound of a peculiar principle with ammonia; that the black principle itself, such as is obtained from the urine by the action of dilute acids, may be considered as a new body possessed of acid properties. To this black acid principle Dr Prout applied the name of MELANIC Acid.*

It is supposed by various recent authorities that this black-coloured acid principle is a modification of the colouring matter of the blood or hematosin. But very little more satisfactory information on its origin, its etiology, or its pathological relations has been communicated.

The black coloration of the skin of the young woman seen by Dr Marcet in 1802 may be compared with the black colouring inky-like matter described by Mr Teevan, as appearing in the forehead and face of a young lady seen by him† in 1845. An inquiry, not unimportant is, whether, in other cases in which the skin presents or secretes this black colouring matter, the urine does not, in like manner, contain black matter.

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* Account of a singular variety of urine which turned black soon after being discharged; with some particulars respecting its chemical properties.—By Alexander Marcet, M.D., F.R.S. Read 5th August, 1822, Medico-Chirurgical Transactions, Volume Twelfth, p. 37, London, 1823,

† Medico-Chirurgical Transactions, volume Twenty-eighth, p. 611.

It probably should have been mentioned at an earlier stage of this Memoir that is in the course of 1811, though we are not informed of the exact period, that Dr Prout was led to form on the teeth, the opinion that they were to be considered as appendages to the integuments, and to be arranged with horns, nails, and similar substances. He had at that time drawn up the outline of a memoir on the subject in general, founded upon extensive anatomical inquiries, showing the analogy between the formation of the teeth and that of horns, feathers, nails, and partly upon physiological and pathological reasonings. The paper was never published, but the opinion was communicated to many of the friends of the author at the time. It was fully eight years after this period that M. De Blainville advanced an opinion essentially similar, that the teeth are to be considered as hairs.*

The year 1823 was marked in the life of Dr Prout by the discovery of a fact important to the physiologist. This was, that the fluid or juice secreted by the stomach soon after the introduction of food into that organ, and which had previously been known to possess acid properties, owes these properties to the presence of free hydrochloric or muriatic acid. In a short memoir communicated to the Royal Society on the 11th December 1823, Dr Prout showed by experimental proof that the acid contained in the stomach is muriatic, and that the salts usually met with in the stomach are alkaline muriates. The acid, free or unsaturated, varied in different experiments from 1·57 grains to 2·72 grains. Dr Prout also found that in the fluid ejected from the stomach in severe cases of dyspeptic disorder, this acid increases in amount, being so high as 5 grains or 17 of saline matter.†

The establishment of this fact is most important to physiology. It was subsequently confirmed by Children, by Messrs Tiedemann and Gmelin and other experimentalists. Dr Prout at a subsequent period so far modified his views as to allow that the gastric fluid might contain chlorine.

The accuracy of these results has not been called in question; but some have put upon them a different interpretation. Dr R. Dundas Thomson has expressed the opinion, that the muriatic acid obtained in these experiments was derived from the muriate of soda used as a condiment. This point it may not be easy to determine. Meanwhile the majority of physiological and chemical authorities have acquiesced in the justice of the conclusions drawn by Dr Prout.

The discovery of Dr Prout furnished the means of giving more plausible and intelligible views of the agents concerned in the process of digestion than it had hitherto been possible to take.

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* Annals of Philosophy, First Series, conducted by Thomas Thomson, M.D., F.R.S., Vol. Sixteenth, p. 113. August 1820.

† On the Nature of the Acid and Saline Matters usually existing in the Stomachs of Animals. By William Prout, M.D., F.R.S. Phil. Transactions. 1823. p. 45.

It was manifest that this acid could be obtained only from the blood. In the serum of that fluid is found a considerable proportion of muriate or hydrochlorate of soda. This hydrochlorate of soda, upon the introduction of food into the stomach, becomes the subject of a chemical action, which is either under the influence of a vital or of an electric action. Acid or chlorine is separated from the blood by the arteries and cells of the stomach. The blood would be charged with an undue proportion of soda, if some provision were not made to elicit this from the same blood. This separation or exudation of alkali actually takes place in the extremities of the hepatic artery and in those of the pancreatic artery. In this manner, while the hydrochlorate of soda contained in the blood gives its acid portion to the stomach, it gives the alkaline to the stomach and pancreas, and perhaps to the jejunum; and thus the saline impregnation of the blood is constantly preserved at the same rate.

It is probably anticipating in some degree the subsequent history of this important discovery to advert to the facility with which its facts may be referred to an agency like the electric. At the time at which the discovery of Dr Prout was announced, though chemists were sufficiently familiar with the great and irresistible power of electric action and also its extensive influence in effecting and dissolving chemical unions, yet probably a sufficient number of individual examples had not become known to familiarize the mind with their constant and habitual presence. It has since that time become almost an established principle with several physiologists, whether well-founded or not, that in this disunion of the chloride of sodium in the blood the gastric vessels and cells perform the part of the positive pole, and the hepatic and pancreatic vessels that of the negative pole of an electrical apparatus. It must not, however, be supposed that all this is firmly established on the evidence of experiment and demonstration; it is merely a mode of explaining facts which are known to take place. It is an inference deduced from those facts; possessing certainly a high amount of probability, but not yet demonstrated, and probably not susceptible of strict demonstration. For further illustration on this subject, however, the reader will do well to consult the experimental inquiries of Bouchardat, Mialhe, and Cl. Bernard, and the notices of them given in different volumes of this Journal.

Such are the results to which the fact discovered by Dr Prout leads. It would involve a digression too lengthened in this place, to advert to the presence, the influence, and the properties of the peculiar animal principle, Pepsin, which exists in the gastric fluid, and which was several years afterwards made more completely known by the researches of Schwann. It is sufficient to observe that the presence of both the chemical agent and the animalizing principle is unquestionably necessary to the healthy digestion of the alimentary articles; and that in all these transforming or assimilating fluids, as the gastric fluid, bile, pancreatic juice, intestinal fluid, there is every reason to believe that there exists not only a chemical principle, but an animal and animalizing or assimilating principle.

Three years after the appearance of this memoir Dr Prout found it requisite to defend himself against certain statements made by Messrs Tiedemann and Gmelin, and also MM. Leuret and Lassaigne.

The statement of MM. Leuret and Lassaigne were to the effect, that "Dr Prout having saturated with pure potash the quantity of fluid, in which he professed to discover the amount of muriatic acid, free and combined, evaporates it to dryness, and calcines the residue to destroy organic matter. Dissolving then the residue in distilled water, he estimates by means of nitrate of silver the proportion of muriatic acid obtained by the experiments." This method, these gentlemen designated as vicious and erroneous; because the excess of potash employed reacts upon the azotized matters during calcination, and cyanuret of potassium and subcarbonate of potash are formed, constituting in part with the muriates the saline residue. As, however, cyanuret of potassium and subcarbonate of potash precipitate nitrate of silver, the conclusions drawn by this chemist as to the presence and amount of muriatic acid must be, they alleged, erroneous.

The objection was altogether imaginary, and the result of the invention of these ingenious physiologists. The answer of Dr Prout was simple and conclusive. He always supersaturated the excess of potash by nitric acid before the nitrate of silver was employed.

It is not easy to say whether the recklessness of writers who make such statements, or their ignorance of the known methods of procedure in analysis, be most extraordinary.

The statements made by Messrs Tiedemann and Gmelin were various.

1*st.* They allow, that the first discovery of free muriatic acid in the gastric fluids is due to Dr Prout. But they also advance a sort of concurrent claim; because they in like manner discovered this acid in the fluid of the stomach in February 1824. Dr Prout, it may be observed, discovered this acid in a free state previous to December 1823, on the 11th of which month the memoir communicating the discovery was read to the Royal Society.

2*d.* The physiologists of Heidelberg and Tubingen find in the gastric contents other two acids, namely, the acetic and the butyric; and they seem to wish it to be believed, that Dr Prout in discovering the existence of muriatic acid denied the presence of other acids. The object of Dr Prout in his paper was the simple establishment of the fact, that normally the gastric juice contains free hydrochloric acid. He believed then, as he did afterwards, that this acid occurs naturally more frequently, and in greater abundance than any other acid. He did not, however, deny or doubt, that these acids might exist in the stomach under all the varied circumstances of diet and derangement to which the organ is exposed.

The question as to the lactic acid has been always perplexing, and is perhaps not yet decided. It was long supposed to be merely acetic acid disguised and modified. Dr Prout appeared of late years to think that when present it was so as an indication of disordered and imperfect digestion.

3d. MM. Tiedemann and Gmelin represented the method employed by Dr Prout to determine the nature and quantity of the acid contained in the stomach to be inexact and imperfect. It is evident, that they had not carefully studied the account of the method pursued by Dr Prout. Had they done so, no statement of the kind could they have made. All that Dr Prout did in this instance was, to reprint the passage containing the details of his mode of procedure. Dr Prout was indeed an experimenter too careful and too accurate to permit his researches to be nullified by any want of precaution, or any inattention to sources of error.

4th. The next statement advanced by MM. Tiedemann and Gmelin related to the question of the earliest or highest point of the alimentary canal at which albumen appears. Dr Prout had in the first Memoir on Sanguification already referred to, stated, that the contents of the stomachs of animals feeding on vegetable substances, even when fully digested, exhibit no traces of an albuminous principle; but the moment they enter the duodenum they undergo remarkable changes, not only in appearances but in properties. These changes appear to be chiefly induced by the action of two secreted fluids with which they come in contact and are intimately mixed—the bile and pancreatic juice. The changes produced, continues Dr Prout, in the alimentary matters by these fluids are evidently of a chemical nature. A gaseous product is usually evolved; a distinct precipitation of the bilious principle, in apparent union with some others, chiefly of an excrementitious nature, takes place; the mixture becomes neutral; and an albuminous principle is formed, or at least traces of an albuminous principle appear, which, further, become much more distinctly visible at some distance from the pylorus.

Though this is all that Dr Prout stated, MM. Tiedemann and Gmelin represent him as asserting in general terms, that albumen is solely formed in the duodenum, and not capable of existing in the stomach if placed there in the form of food. It should not be forgotten that the statement of Dr Prout applies to animals feeding on vegetable substances.

It must be at the same time allowed that many vegetable substances, supposed at that time not to contain albumen, are known to furnish it; and certainly herbivorous animals extract albumen from the vegetable matters which they consume as food.

5. M M. Tiedemann and Gmelin affirm in the last place, that Dr Prout was unacquainted with the composition of the pancreatic liquor. To this Dr Prout answered, that in 1819, when he published this memoir, he did not know the composition of the pancreatic juice; and he allows that even in 1826 he knew less of it than he could wish. He expressed the belief, however, that it contains albumen, and admits that some of the albumen found in the duodenum may be derived from this source; though he is decided in thinking, that by far the greater proportion found there under the circumstances specified, is derived from the food, and is developed within the bowel during the series of changes which there take place under the action of the bile and pancreatic liquor.

It has been since that time ascertained by M. Bouchardat and M. Claude Bernard that pancreatic juice does contain a peculiar animal principle, albuminous in character; and as bile also contains a similar animal principle, it is not unreasonable to infer, that these principles possess a certain degree and form of assimilating power, in contributing to the separation and developement of the albuminous principle. The final developement of the views of Dr Prout on this subject must be sought in the concluding discourse of the fourth and fifth editions of his work on Stomach and Urinary Diseases; and in the third book of the Bridgewater Treatise.

The discussion to which the paper on the presence of free muriatic acid in the gastric juice gave rise, has rendered some anticipation necessary. Upon the subject of digestion Dr Prout had both been meditating and experimenting not a little; and he had so far matured his ideas and the results of his researches, that in November 1823, he announced the publication of a work on the Functions of the Digestive Organs, especially those of the Stomach and Liver. This undertaking, however, he was prevented at that time by other circumstances from carrying into effect. The Inquiry had been so much and so generally read that the impression was nearly exhausted; and another edition required to be published with as little delay as possible. At the same time Dr Prout found that his knowledge of urinary diseases gave rise to the occupation of much time in giving advice to persons suffering under maladies of this order. Lastly, he was at this time much engaged in making analyses of various organic substances, and also in examining chemically different sorts of wine for his friend Dr

Alexander Henderson, who was occupied in the preparation and publication of his instructive History of Ancient and Modern Wines.

In activity of mind, indeed, at this time few scientific persons appear to have been equal to Dr Prout, and perhaps it would not be easy—considering the accurate manner in which his researches were conducted—to mention any one who was much superior to him. Much he undertook in those difficult and obscure regions of science in which physiology and chemistry require to be conjoined and give each other mutual assistance; and whatever he undertook he accomplished with precision and ability. One object he always kept in view, and this was to make others as good physical and chemical inquirers as himself; to show the profession at large the means by which they were to prosecute the requisite inquiries; and to make known to them the simplest and most effectual means for enabling them to obtain the necessary information. Something of this had he shown in his account of the best mode of demonstrating the composition of urea, albumen and sugar; and he was at this time, as shall presently be seen, occupied in giving these methods of inquiry greater perfection and higher degrees of accuracy. In the same spirit he made known, in April 1825, the most suitable form of construction for a very useful instrument in studying the morbid conditions of the urine, serum, and similar fluids. This was the portable Hydrometer, or what has since been sometimes called, with little felicity of nomenclature, the Urinometer. This instrument, which is exactly the Hydrometer, which has for many years been in use among physicians, was at the time a valuable acquisition. It is now so common and so generally used that the merit of introducing it is entirely forgotten.* The only peculiarity in the instrument proposed by Dr Prout is in the numeration of the scale, on which are marked only the numbers rising above 1000, which, as the specific gravity of distilled water, is taken as the standard; and, consequently, to the numbers indicated by the position of the hydrometer in the fluid subjected to examination it is requisite to add 1000. Since that time the scales have been constructed in general with the full numbers upon it.

The second edition of the Inquiry appeared in May 1825, in a form considerably enlarged, forming now an octavo of three hundred and eighteen pages. The arrangement of the materials was slightly altered, the work being divided into two parts; one on Functional Diseases of the Urinary Organs, the other on Mechanical and Organic Diseases of the Urinary Organs. The first part was divided into two sections, the first of which corresponded to the first section and its chapters in the first edition;

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* Description of an Instrument for ascertaining the Specific Gravity of the Urine in Diabetes and other Diseases. By William Prout, M.D., F.R.S. April 2d, 1825. Annals of Philosophy, Volume Ninth, (Twenty-fifth May) 1825, p. 334.

while the second, embracing five chapters, corresponded to the five first chapters included under the second section of the first edition; the fourth chapter, on the oxalate of lime and cystic oxide diathesis being subdivided into two chapters, the seventh and eighth of the second section.

The second part of the new edition, on the Mechanical and Organic Diseases of the Urinary Organs corresponded to the sixth and seventh chapters of section second of the first edition. But as it was much enlarged by the addition of new matter, and as the materials of these sixth and seventh chapters were to a certain extent those forming the first and second chapters of this second part, a third chapter was added as a recapitulation of the practical directions which arose out of the whole inquiry.

Of this second edition a short account was given in April 1826 in the twenty-fifth volume of this Journal. The additions and improvements were considerable; but as we refer to this for particulars, it is unnecessary to recur to the subject. One topic only among many deserves mention, as an example of the pains which Dr Prout took to rectify erroneous therapeutical practices, while he was willing to allow their full weight to methods which seemed to be recommended on the evidence of experience. Sir Gilbert Blane had many years previously directed attention to the effects of saline compounds containing a vegetable acid, for instance, Rochelle salts, cream of tartar, and citrate of potash, in rendering the urine alkaline. The fact has been, since that time, rendered available in attempting the removal and counteracting the effects of the presence of lithic acid; and it is in the lithic acid diathesis that Dr Prout allows that alkaline remedies and saline mixtures containing a vegetable acid may be expected to be beneficial. In most cases of this form of disease, namely, the lithic acid diathesis, says Dr Prout, there is not a more effectual remedy than these saline compounds and the common saline draughts. But he adds, in other states of urinary disease, were I required to name the remedy calculated to do the most mischief, I should name the common saline draught formed of potash or soda and some vegetable acid.[*] He afterwards more fully explains, that, in the treatment of the phosphatic or earthy diathesis, those medicines containing a vegetable acid, as Rochelle salts, Seidlitz powders, and alkaline remedies of every description, ought to be most carefully avoided.[†]

The publication of the second edition of the Inquiry could scarcely add to the reputation of Dr Prout as a skilful chemico-pathological physician. But it diffused the knowledge of his attainments both among practitioners and patients; and Dr Prout was esteemed, in all diseases in which the urinary secretion was disordered, a first authority not merely in the metropolis, but in the places most remote from it. Meanwhile the author was assiduously engaged in prosecuting the original and favourite subject of his thoughts, the function of assimilation and its departments. At length, on the 14th of June 1827, he communicated to the Royal Society a Memoir which was intended to be the first of a series on this difficult and important subject. This was his essay on the Ultimate Composition of simple alimentary substances; with some Preliminary Remarks on the Analysis of Organized Bodies in general.*

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[*] Inquiry into the Nature and Treatment of Diabetes, Calculus, and other Affections of the Urinary Organs, chapter vi. p. 144. Second Edition. London, 1825.

[†] *Ibid.* p. 184.

This memoir consists of two parts. In the first part, the author, after referring to his early attempts in this way particularly, the paper published in the sixth and seventh volumes of the Annals of Philosophy, and the eighth and ninth volumes of the Medico-Chirurgical Transactions, and stating the difficulties to be encountered in the analysis of organized bodies, describes an apparatus by which he found that these difficulties were obviated, and accurate results could be obtained with comparative facility.

Dr Prout distinguished the principal alimentary matters employed by man and the MAMMALIA into three great classes; namely, the SACCHARINE, the OILY, and the ALBUMINOUS. The second part of the memoir was devoted to examination only of the first of these classes; understanding by this term not merely the different forms of sugar usually included under it, but all these vegetable substances, whatever be their sensible properties, into the composition of which hydrogen and oxygen enter, and the same proportions in which they form water. As the substances thus constituted may generally be employed as aliments, and as they are chiefly derived from the vegetable kingdom, they may be considered as representing vegetable aliments, properly so called; hence, adds Dr Prout, SACCHARINE and VEGETABLE aliment may be regarded as synonymous terms, and they will be so employed throughout the present inquiry. It is quite indispensable to keep this classification in view, not only in studying the chemical researches of Dr Prout, but also in perusing the subsequent editions of his Inquiry.

Dr Prout examined carefully the composition of cane-sugar, sugar of honey, sugar prepared from starch, east India sugar, maple tree sugar, beet root sugar; the different forms of starch; lignin or the woody fibre; acetic acid or vinegar; sugar of milk; manna sugar; gum arabic; and among the vegetable acids, the oxalic, citric, tartaric, malic, and lactic.

It comes not within our purpose to give an analysis of this paper, which should be studied attentively by the physician and physiologist; neither is it requisite in this place to dwell on the results obtained by the labours of Dr Prout. But one observation in the Memoir is so profound, and implies results so important, that justice to the author, as a chemical philosopher, requires it to be noticed.

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* Philosophical Transactions, 1827, p. 355.

In proceeding to consider the analysis of amylaceous or starchy substances, Dr Prout remarks, " that it has been known from the very infancy of chemistry, that all organized bodies, besides the elements of which they are essentially composed, contain minute quantities of different foreign bodies, such as the earthy and alkaline salts, iron, and similar substances. These have usually been considered as mere mechanical mixtures accidentally present; but I can by no means subscribe to this opinion. Indeed much attention to this subject for many years past has satisfied me that they perform the most important functions; in short, that organization cannot take place without them. This point will be more fully investigated hereafter. At present it is sufficient to observe, that many of these remarkable changes which crystallized bodies undergo in becoming organized are more apparent than real; that is to say, their chemical composition frequently remains essentially the same; and the only points of difference that can be traced is the presence of a little more or less of water, or the intimate mixture of a minute portion of some foreign fixed body. There is no term at present employed which expresses this condition of bodies; and hence to avoid circumlocution, I have provisionally adopted the term *merorganized* (μερος, *pars*) meaning to imply by it, that bodies in passing into this state become partly or to a certain extent organized. Thus starch I consider as *merorganized* sugar; the two substances having, as we shall see presently, the same essential composition; but the starch differing from the sugar by containing minute portions of other matters which we may presume prevent its constituent particles from arranging themselves in the crystalline form, and thus cause it to assume totally different sensible properties." [*]

Dr Prout continues to observe (in a note) that when the subject first occupied his attention, many years ago, referring evidently to his examination of the chemical composition of the egg and similar substances, he was at a loss to form any notion of the *modus operandi* of these minute admixtures of foreign bodies, except the mechanical one now mentioned; that is, that they operated by being interposed among the essential elements of bodies, and thus weakened or modified their natural affinities. He allows, however, that the views given by Mr Herschel in his Memoir in the Philosophical Transactions for 1824, on certain motions produced in fluid conductors when transmitting the electric current, throw on this subject a light entirely new. It was in that memoir shown that most minute portions of extraneous matter are capable of communicating sensible mechanical motions and properties of a definite character to the body with which they are mixed. He infers accordingly, that when we see energies so intense exerted by the ordinary forms of matter, we may reasonably ask, what is the evidence for the imponderability of any of the powerful agents to which so large a part of the activity of material bodies seems to belong?

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[*] Philosophical Transactions, 1827, p. 374.

This last question is probably opening up a new inquiry, which, though not irrelevant, does not, perhaps, ally itself very intimately with the one stated by Dr Prout. We feel the difficulty as well as the delicacy of making any remarks upon a subject so obscure. But it appears to us unfortunate, if not unphilosophical, to apply to these alkaline, earthy, and metallic salts found intermingled in organized bodies, the names of *foreign* and *extraneous*. It seems altogether an assumption, that these substances, however minute be their proportions, are to be regarded as foreign and extraneous; for no organized bodies, either vegetable or animal, are ever found without them; and it is a well ascertained fact, that vegetables cannot grow or be produced without being supplied with, or having access, to certain proportions of these alkaline, earthy, and occasionally metallic salts. Indeed, strictly speaking, all of them are metallic salts; for potass and soda, lime and magnesia, are quite as much oxides of metals as the oxide of iron, the oxide of copper, or the oxide of lead. If, then, no organized bodies are ever found without the presence of more or fewer of these metallic salts, why should the latter be regarded as foreign and extraneous? More rational, and certainly more consonant with the facts, would it be to say, that these metallic salts, though differing in chemical character and properties, from those principles which have been called the essential principles of organized bodies, are nevertheless necessary to the growth, formation, and existence of these latter. This, indeed, Dr Prout has already said, in stating the proposition, that without the presence of these metallic salts, we include the alkaline and earthy metallic salts, organization cannot take place.

This, it must be allowed, is the enunciation of a great physiological and chemico-physiological principle; and in stating it, in 1827, Dr Prout anticipated by several years one of those doctrines for which Liebig has assumed and received so much credit. It is manifest that the short, clear, and pointed remarks of Dr Prout on this subject have either never been read and considered, or their tendency and the new and important views which they laid open were not at all understood. Whatever merit may be in the recognition of the principle, that the presence of these metallic salts in organized bodies, vegetable and animal, is not accidental but necessary and uniform, and is truly subservient to important functions in their development, growth, and nutrition, belongs in the first instance to Dr Prout, and in some degree to Sir William Herschel.

In this memoir, however, Dr Prout refrained from making any of those general observations which might appear as deductions from his facts, for two reasons; first, because such observations, he argued, would appear with greater effect when the whole of the facts in his possession were placed before the public; and secondly, because it was his opinion that data which lead to conclusions so important as these appear to do, cannot be too firmly established; and he was desirous that chemists in general might repeat his experiments, and either point out errors or confirm the results. Dr Prout was, however, himself prevented by the increasing claims of professional occupation and other circumstances connected with this and with his other scientific pursuits, from publishing any subsequent memoir on the ultimate composition of the simple alimentary substances; and hence his doctrines on the nature and changes which these substances undergo in the living body did not receive, at least in this form, that full development which it was the original design of the author to give them; and it was only in the enlarged form which the Inquiry in subsequent editions assumed, and in the Bridgewater Treatise, soon to be noticed, that these doctrines were illustrated and applied.

Meanwhile, the great merits of this memoir, both as placing at the disposal of the practical chemist new and powerful means of analysis, and also as enlarging and rendering more accurate our knowledge of the nature of alimentary articles, were so readily and unequivocally admitted, that the Royal Society thought the author worthy of the Copleian medal,—the most honourable gift which they had in their disposal. This was accordingly presented to Dr Prout on the 30th November 1826, by the President, Davies Gilbert, with an appropriate address, in which the analytical ingenuity and the discoveries which Dr Prout had made, and was likely further to make, were commemorated in graceful terms.

In 1831 Dr Prout was appointed to deliver at the College of Physicians, the Gulstonian Lectures on the application of Chemistry to Physiology, Pathology, and Practice. Dr Wilson Philip being displeased with some of the opinions therein delivered, subjected them to examination and criticism in the pages of the Medical Gazette. This produced from Dr Prout a rejoinder and vindication something keen; and a controversy more warm, perhaps, than the friends of science would approve, ensued. It is not easy, without entering into more ample and minute details than are compatible with the limits of the present notice, to form any useful opinion on the merits of the questions discussed. Some of the points objected to by Dr Wilson Philip related to the signification of terms employed by Dr Prout, and were of the nature of verbal discussions. In others, it was manifest that he thought that Dr Prout was elevating the laws of chemical action above those of vital action, in explaining the phenomena and functions of living bodies; and this again led to some metaphysical disquisition upon the existence and nature of what has been denominated the vital principle.

There was, nevertheless, in the Gulstonian Lectures little which had not appeared in the papers by Dr Prout in the Philosophical Transactions, and some parts of the second edition of the Inquiry.* It always appeared to us, that had, Dr Wilson Philip studied with care the facts communicated and the inferences deduced in these papers, and deliberately compared them with each other, he would either have refrained from criticism altogether, or would have confined his remarks to a very limited sphere indeed. If mere differences of opinion are to be made the foundation for discussion and controversy, scarcely a new Memoir on any difficult subject in science can be expected to make its appearance, without giving rise to lengthened and probably not very profitable controversy. It is not unseasonable to remark, that almost all the controverted points as to chemical doctrines have since this time been either admitted or adopted by subsequent authors. One writer, well known in the pages of this Journal, entered on the consideration of one part of the discussion—that relating to the question of organic agents with the vital principle. But he seemed to differ as much from Dr Wilson Philip as he did from Dr Prout. As the same author subsequently made some critical remarks on certain doctrines in the Bridgewater Treatise, it may be necessary to recur to the subject when speaking of that performance. At this distance of time, the most eligible course is to leave the debated points in the silence, to which they have in the course of twenty years been consigned.

The subject of Natural Theology, or the Inquiry into the Proofs of the Existence, Power, Wisdom, and Benevolence of the Supreme Being, deducible from the phenomena of the material world and the construction and habits of its living inhabitants, has at all times been a favourite pursuit with the English nation. The taste for the investigation was first called forth by Robert Boyle, and with great ability was it cultivated by the series of lectures founded by that devout philosopher; while his indefatigable contemporaries, Ray and Derham rendered it by their labours deservedly popular. The subject is nevertheless by no means easy or simple. It is, on the contrary, embarrassed with considerable difficulties on certain points; and though some of these difficulties were seen, admitted, and attempted to be obviated by Paley, yet all of them cannot be said to be removed; and perhaps the longer the subject is investigated, though some of these difficulties may be obviated, others may arise, and continue to beset the Inquiry. These difficulties can scarcely be said to belong to the question of the existence, the power, or the wisdom of the Deity; but it is not unknown that in some respects the enemies of religion have often easily obtained arguments, which they conceive are at variance with the attribute of benevolence. In some respects it is presumptuous in no ordinary degree for beings with faculties so limited as those of the human race, to undertake to examine as judges, the works of a Being infinite in power and wisdom as well as in duration. In part only we see; and how can we examine or pronounce an opinion upon the whole? But unhappily this argument applies to the foes and the friends of natural theology; and, in point of fact, professed friends have not unfrequently injured the cause which they meant to serve, by attempting, with injudicious ingenuity, to account for phenomena which seemed either decidedly at variance with the attribute of benevolence, or certainly doubtfully in its favour. All this ought to inculcate great caution and delicacy in the pursuit of those inquiries, which have for their object to demonstrate, from the phenomena of the material world, the attributes of the Supreme Being. It is doubtless our duty to study and endeavour to understand all these phenomena, their mutual relations, and their tendencies; but in many instances to attempt to discover design and intention, and especially good intention, is so great a piece of presumption, and implies an opinion, so exalted, of the human intellect, that it appears as if no one but a very conceited and vain being can make such an attempt. It is for this reason that the attempt to discover proofs of design and benevolent design in our examination of the phenomena of the natural world, if not under the control of great discretion and sound judgment, must prove to be a very unprofitable and dangerous occupation.

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* Observations on the application of Chemistry to Physiology, Pathology, and Practice. By William Prout, M.D., F.R.S. Being an Abstract of the Gulstonian, Lectures, as delivered at the College of Physicians. Also Medical Gazette, vol. viii. pp. 257, 321, 385. London, 1831.

Notwithstanding these objections and difficulties, nevertheless, with which all inquiries into the great principles of Natural Religion are attended, few subjects probably in this country have occupied a larger amount of human reflection and ingenuity; and the result has been, that the literature of no country has produced so great a number of treatises on these principles, and, it may be added, works in which so much learning and knowledge have been employed. So great is the number of these treatises, that alone they would form a considerable library; and the great object of writers in modern times, when arguments have been often reproduced, and presented in different forms and new aspects, is partly to select from the great body of reasoning already produced those most pointed and conclusive; and partly, amidst the new facts and new views furnished by the advanced and improved condition of all the sciences, to apply with new force and illustration those which former experience and mature reflection show to be best adapted for the purpose. Little doubt can be entertained, indeed, that in such a science the perfection of the deductions applied to the service of natural religion must depend very much, if not wholly, upon the perfection of the physical sciences themselves; and arguments which might either have been misapplied or were inapplicable in the beginning and middle of the eighteenth century, might be most forcible and conclusive in the nineteenth century. The science of living bodies particularly, or that denominated physiology, has made great progress, has been rendered much more precise, and has been cleared from many obscurities with which it was perplexed. Geology also, if it have not been entirely created since the commencement of the nineteenth century, has certainly received so great an accession of important and accurate facts, that it has assumed the appearance of a science totally new. With these advantages, if Natural Theology be a science to be cultivated at all by the human intellect, it cannot be matter of doubt, that any new attempts which were to be made in the second quarter of the nineteenth century might be greatly more perfect, and would furnish more satisfactory results than any of those which had been previously undertaken. In short, this branch of human study requires to be periodically examined and reviewed, and all its proofs and arguments subjected to examination, at intervals as short and at times as frequent as any other, in order that its doctrines may be corroborated and elucidated, confirmed and expanded, or if need be, modified, amended, and rectified, and thereby made capable of producing upon the mind those beneficial results which enlarged and correct views are always sure to effect.

In another respect the Science of Natural Theology is placed in peculiar circumstances. To write a useful work on the subject, the author requires to have a competent, sometimes an extremely accurate knowledge of several distinct branches of physical science, as well as the talent of selecting facts, principles, and doctrines, and placing them in the proper light for the illustration of his own subject. It hence results that it is not always a very easy matter to obtain the requisite combination of knowledge and talents for the purpose; because it rarely happens that the same individual unites an accurate knowledge of astronomy, geology, chemistry, and physiology. In modern times, indeed, we are so little accustomed to see this remarkable union of attainments, that it is generally believed that no single individual can be equally skilful in several sciences; and probably the only person in modern times who has in some degree formed a exception to this rule is Alexander Von Humboldt. Yet even in this instance, the exception, so far as it goes, tends to confirm the rule. It would not be easy, in the present day, for the same individual to accomplish what was done by Derham, in a manner commensurate with the demands of the present state of the physical sciences; and when we remember, that the vigorous mind of Paley studied anatomy and physiology, when the tenement that held that mind had seen sixty winters, it is easier to imagine than to encounter and remove the difficulties in getting such an undertaking accomplished in a creditable manner.

The most obvious method is to have recourse to what has been named the division of labour; and to enlist in the task the talents of several individuals, who might each be understood to be thoroughly acquainted with his own department, while he had a general knowledge of others and the mutual relations of all the branches of physical science. Exactly one hundred and forty years ago something of this idea had occurred to a man, to whom English literature is under great obligations. It was the wish of Addison that the Royal Society would compile a body of natural history, the best that could be gathered together from books and observations. "If the several writers among the Society," says he, in reference to animal physiology and zoology, "took each his particular species, and gave us a distinct account of its original, birth, and education; its policies, hostilities, and alliances; with the frame and texture of its inward and outward parts, and particularly those that distinguish it from all other animals, with their peculiar aptitudes for the state of being, in which Providence has placed them; it would be one of the best services their studies could do to mankind, and not a little redound to the glory of the all-wise Contriver."*

Similar or the same appears to have been the thought of a noble and reverend clergyman of the Church of England, whose munificence, at the interval of more than one century, enabled the Royal Society to carry into effect the plan originally suggested by Addison, and upon a scale much more extensive, than probably Addison could have in his most sanguine moments anticipated.

In February 1829 the Right Honourable and Reverend Francis Henry Earl of Bridgewater died at Paris; having directed, by his last will and testament, dated 24th February 1825, certain trustees therein named to invest in the public funds the sum of eight thousand pounds sterling; which, with the dividends thence accruing, were to be placed at the disposal of the president for the time being of the Royal Society, for the following purpose. That the said president should select a person or persons to write, print, and publish one thousand copies of a work on the Power, Wisdom, and Goodness of God, as manifested in the Creation; illustrating such work by all reasonable arguments, as for instance the variety and formation of God's creatures in the animal, vegetable, and mineral kingdoms; the effect of digestion, and thereby of conversion; the construction of the hand of man, and an infinite variety of other arguments; as also by discoveries, ancient and modern, in arts, sciences, and the whole extent of literature. It was further the desire of the testator that the profits arising from the sale of the works so published should be paid to the authors of the works.

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* Spectator, No. 121, July 19, 1711.

The then president of the society, Davies Gilbert, Esq., having availed himself of the assistance of the Archbishop of Canterbury and of the Bishop of London, in determining the most eligible mode of carrying into effect the intentions of the testator, with the advice of these prelates and a nobleman immediately connected with the deceased, appointed eight gentlemen to write each a treatise on different branches of the subject; and to Dr Prout was assigned the department of Chemistry, Meteorology, and the Function of Digestion, considered with reference to Natural Theology.

This was the first occasion in which the phenomena of chemistry had been considered in detail in reference to Natural Theology. The undertaking was not without difficulties, but it was one for which Dr Prout possessed peculiarly good qualifications. To the peculiar position of chemistry, and especially organic chemistry, reference has been already made. It was an immense mass of facts, new, wonderful, and of great promise; but little animated by general principle, and almost void of method. It was the firm belief of Dr Prout that, sooner or later, the phenomena of chemical action would be brought under the dominion of the laws of quantity; that, in short, chemistry was one of the exact sciences. It has been shown that Dr Prout had, many years previous to this date, endeavoured to show and determine how far this idea was well-founded. Since that time much had been done to confirm his views. Many distinguished chemists had adopted and applied them; others had carried them into the general domain of chemical analysis; Dr Prout himself was preparing to give a general theory of chemical action in the material world and in those branches of animal physiology with which he was most familiar. The eighth Bridgewater Treatise appeared on the

3d of February 1834, and a second edition of the work was issued on the 7th of June of the same year.

The treatise consisted of three parts or books; the first treating on Chemistry, the second on Meteorology, and the third on the Chemistry of Organization.

The first book was subdivided into ten chapters, devoted to the following subjects:—

Chapter first. Of the leading argument of natural theology; that design, or the adaptation of means to an end, exists in nature.

Chapter second. Of the rank of chemistry as a science, and of the argument of design with reference to chemistry.

Chapter third: Of matter and of agents in general; and of their mutual relations.

Chapter fourth. Of matter in general; embracing the subjects of,—1st, mechanical divisibility; the malcular condition; 2d, the forms of aggregation of molecules; and, 3d, arguments proving that the molecular condition has not always existed, but must have been created by an Intelligent Being.

Chapter fifth. Of agency in general; 1st, unintelligent or physical agency; 2d, intelligent agency.

Chapter sixth. Of the mutual relation and laws of the operation of the forces of gravitation.

Chapter seventh. Of the mutual relation and laws of the operation of the molecular forces of matter; comprehending heat, light, electricity, and magnetism; the sources of these agents, and the means of measuring their degrees of intensity.

Chapter eighth. Of homogeneous attraction and repulsion; comprising a sketch of the phenomena dependent on the cohesive and divellent forces mutually exerted between molecules of the same matter.

Chapter ninth. Of heterogeneous attraction and repulsion; comprising a sketch of the chemical phenomena dependent on the attractive and divellent forces exerted among the molecules of dissimilar matters.

This chapter is subdivided into four sections, comprehending, 1. Primary elements; 2. The laws of heterogeneous and homogeneous union; 3. Chemical compounds; and, 4. The motions of imponderable and ponderable molecules.

Chapter tenth. General reflections on the subjects treated in the preceding chapters.

The second book, which is divided into seven chapters, presents an interesting and highly instructive view of the multiplied facts which now constitute the science of meteorology, with their most serviceable and important applications.

The third book is divided into four chapters; the first on the composition and nature of organized bodies in general as compared with inorganic matter, and on their qualities which fit them to be used as alimentary articles; the second on the modes of nutrition, first in plants, secondly in animals, and the history of the organs subservient to the function of nutrition in the latter; the third on the digestive powers; and the fourth on the processes of assimilation and sanguification, respiration, and the secretions.

The nature of this sketch renders it impossible to give anything like an analysis of the contents of this excellent treatise, which was further noticed in a general manner in the sixty-seventh volume of this Journal.* To be properly understood the work should be carefully studied and repeatedly perused; and it may be justly asserted, that no medical practitioner can peruse it without great advantage. The two first books are remarkable for giving correct and philosophical views of chemical science; and, if perused after the reader has become well acquainted with chemical phenomena and the peculiar characters of chemical action, will enlarge his mind and rectify his thoughts in a manner which can be done by no mere treatise on chemistry. Dr Prout is a cautious and judicious friend of that doctrine which is known in chemical science as the Atomic Theory. His proofs in its favour rest on solid and substantial grounds; and, while he deduces from its phenomena strong arguments in proof of the operation of design, he allows that in certain circumstances there are difficulties, which it is to be hoped further knowledge and future experiments may finally remove. It seems, indeed, to be of little moment by what name the facts indicative of this theory are to be designated; whether atomic, molecular, or that of definite proportions. It is undeniable, that wherever facts have been carefully observed and results accurately estimated, it has been found, that the elements of bodies unite in certain fixed proportions either of volume or of weight, when these affections are capable of being ascertained.

The second Book is remarkable for presenting in short compass almost the only correct views on climate, and the circumstances on which it depends and by which it is modified; and, as such, it ought to be serviceable at once to the meteorologist and to the scientific physician. The observations on the Distribution of animals over the different regions of the globe have since their appearance been applied to practice by M. Brockhaus in his Maps illustrating Physical Geography.

The third Book, however, is the one in which certainly the professional reader will feel the highest degree of interest, since it presents in a matured form those views on the composition of alimentary articles and the transformations which digestion induces in them, to the elucidation of which Dr Prout had devoted the labours of many years of assiduous inquiry. In delivering the views which are given in this part of his work, Dr Prout was much in advance of the physiology of the day; and the several chapters of this book contain a larger amount of new and accurate information on the subjects of digestion and assimilation than any work at that time before the public. The inferences deduced were in some instances modified from his original views, according as longer experience appeared to justify. The idea, for instance, that the chemical principle in the gastric juice is muriatic acid, Dr Prout so far modified as to represent this principle to be in the healthy and normal state chlorine, and in morbid conditions to be muriatic acid. This view is in accordance with some facts ascertained by Mr Children. The only point in which subsequent inquirers have seen any reason to differ from the views given by Dr Prout is in the single case of the pancreatic juice, which Dr Prout was disposed to believe to be, for the most part, in a slight degree acid,* while M. Bouchardat and Sandras, and subsequently M. C. Bernard, regard it as alkaline. This, however, is not a great matter; and while it is requiring too much to expect that Dr Prout should leave to subsequent investigators nothing for determination, as he allows that this fluid holds in solution matters of alkaline nature closely resembling those found in all animal fluids, it is manifest that no direct contradiction to the results of subsequent experiments is implied.

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* Edinburgh Medical and Surgical Journal, vol. lxvii., January 1847, p. 301.

In the Gulstonian Lectures and in the Bridgewater Treatise Dr Prout† had spoken of an organic agent and organic agents as principles to be admitted in accounting for the phenomena presented by living bodies, and the mode in which chemical actions in them take place. In proposing the hypothesis of the existence of such agents, which indeed was partly adopted from Paley, Dr Prout was quite aware that the hypothesis does not admit of direct and demonstrative proof; and, consequently, in adducing those circumstances which seemed to favour such a hypothesis, he admits and endeavours to answer the most obvious and serious objections to which it is exposed. The probability of the hypothesis was examined in a short well-written essay by Mr John Roberton, a highly respectable surgeon in Manchester, who had just been led to call in question the correctness of some of the arguments of Dr Elliotson on life and organisation, and thence the doctrine or hypothesis of organic agents as proposed by Dr Prout. Mr Roberton argues that there is no evidence for the existence or operation of organic agents, as represented by Dr Prout; and maintains that the observer must finally refer to the direct agency of the Supreme Being those phenomena which Dr Prout attributes to the influence and operation of organic agents.* Our limited space allows not to enter into the merits of this discussion, which is one of extreme difficulty. It is very much psychological not physiological; and in its investigation there must inevitably be much speculation, which, though assuming the name of reasoning, may, notwithstanding, partake very much of fancy and hypothesis. We have often had occasion to point out the difficulties, with which all inquiries of this kind are perplexed. They are inherent in these inquiries, and ought to be regarded as satisfactory reasons for conducting such inquiries with great caution and reserve, if not for avoiding them altogether. It is further reasonable that every one must be allowed to retain on such subjects the right of private judgment; as it is by no means likely that general agreement will ever be attained; and surely if reflecting men reason differently on these subjects and arrive at different conclusions, they may differ without animosity or asperity, and without regarding an opponent as either unphilosophical, or inculcating sentiments unfavourable to morality and religion. If any one wishes to see the objections to the hypothesis of Dr Prout fairly stated and argued in a temperate and philosophical spirit, this he will find in the remarks by Mr Roberton.

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* Bridgewater Treatise, p. 454, chapter iii., third edition, 1845.

† Ibid., book iii., chapter first, section ii. Of the Nature of Organic Agents.

Pantheism, or the substitution of the laws of nature for the Deity, is the great idol before which the mind of England—in various degrees educated and half-educated—has been for the last thirty years bending the knee; and it is chiefly against this species of idolatry, so captivating to the human mind, that it is requisite to make opposition. It is, nevertheless, not by direct measures that opposition can be successfully and effectually made. It is rather by showing that, if there be laws of nature, and laws by which the movements and phenomena of the material world are regulated, these laws must be established by a superior and an intelligent Existence, and must further be subject to the control of that Being. This it was the object of Dr Prout, as of the authors of the Bridgewater Treatises in general, to accomplish. To show that in the construction and maintenance of the material world and its living inhabitants there is design, and that all the arrangements are made with the intention of producing certain effects, it is only necessary to study the phenomena in a careful and unbiassed manner, in difficult and obscure points to suspend judgment, to distinguish those phenomena which are constant and uniform from those which are only occasional and adventitious; and in this manner to determine what are the general classes of phenomena to which the name of Laws of Nature are truly and justly applicable.

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* Critical Remarks on certain recently published Opinions concerning Life and Mind. By John Roberton, Surgeon, &c. London, 1836, 12mo., pp. 80, p. 36. &c.

In this process, however, it must be remembered, that the great machine, as it were, is the human mind; and that all the observations are recorded, and the whole inquiry is conducted in reference to the faculties of that agent. It is the observing and comparing powers of the mind by which the phenomena are observed and compared with each other; it is by the human mind that phenomena which are general and universal are distinguished from those which are casual and partial; it is by the human judgment that a train of reasoning is pursued and conclusions are deduced. It hence results, that it is necessary to establish previously what are called Laws of human Thought, and to discover and fix those general rules by which the validity and conclusiveness of all inferences are estimated. Though upon this point authorities have differed, and much uncertainty as well as division have prevailed, both upon what are laws of nature and what are laws of human thought; yet upon what constitutes design, and upon the question whether certain means contribute to certain ends, it has hardly been possible to maintain decisive difference of opinion, at least among those by whose judgment it seems desirable to be guided. No one doubts, for instance, that the ascent and circulation of the sap in the spring has a particular object in the vegetable world; as little does any one doubt that the movement of the blood in a certain direction in the bodies of animals also serves an important purpose. If it seem at first sight more difficult to discover instances and proofs of design in the phenomena of chemical action, the difficulty is only in appearance; for when they are intimately considered and closely examined in their ends and results, the difficulty vanishes; and the more minute, extensive, and accurate is our knowledge of chemical phenomena either in the inorganic or the organized world, the more convinced we become that there is design, and that consequently there must be a Designer. It is very true that, as Dr Prout observes, though man sees means directed to certain ends, he observes ends accomplished by means which he is totally unable to understand. He also sees everywhere things, the nature and the end of which are utterly beyond his comprehension, and respecting which he is obliged to content himself by simply inferring the existence of design. Among instances of the latter he classes the phenomena of organic life. Amidst this apparent confusion and obscurity, this perplexity and disorder, glimpses are from time to time obtained even of the nature and object of these recondite phenomena; and from the progress made in this way it is not unreasonable to infer, that more complete insight into many of these purposes may be ultimately obtained.

An important and delicate task is that of drawing the distinction between those phenomena in which design is evinced and those in which it is concealed and unperceived, or at least cannot be discovered by the human faculties in their present condition; and this, probably, is the great difficulty in all inquiries relating to this subject. Wherever the natural theologist advances into this obscure and uncertain region he is in great danger of involving himself in a labyrinth, to extricate himself from which reason alone is inadequate. It has been one object of Dr Prout to warn inquirers of this dangerous territory, and to guide them in safety through those inquiries without incurring the risk of wandering in unprofitable speculations.

If, in admitting the probable existence of such principles as organic agents, Dr Prout has appeared to favour the idea, that the Deity works by subordinate means, to carry into effect certain ends, this can never be interpreted into any application detracting from the power of the Supreme Being. The substitution of intermediate agents destroys not the link between the Creator and things created. When his observations on these agents are compared with the principles which Dr Prout establishes in other parts of the Treatise, it will clearly result, that, whether the existence of such agents be recognized or not, it in no manner invalidates the force of the general arguments in proof of the existence of design, of purposes concerted for particular ends, in short, of final causes, and consequently of the existence of the Designer.

The Bridgewater Treatises added much to the sum of human knowledge upon subjects of the highest importance, and must, for a long series of years, be regarded as most serviceable guides to the student. But of all these treatises, if we were required to name one, which contains the kind of information most serviceable to the medical and physiological reader, conveyed in the form most likely to make permanent and beneficial impressions, we should, without hesitation say, that the treatise by Dr Prout is the one answering most completely the conditions required.

Of this excellent work a third edition, with some slight changes, appeared in 1845. Essentially, however, the work preserved all its original characters.

Meanwhile the time was approaching when it was necessary for Dr Prout to enlarge and rectify the Inquiry, with the addition of those acquisitions which chemical physiology and pathology had been making. In 1834, when the Bridgewater Treatise appeared, eight years had elapsed since the second edition of that work had been given to the world; and in the course of that period great advances had been made and continued to be made in the sciences of physiology and pathology; while the progress and greater precision of organic chemistry had been the means of furnishing more just and accurate views on all subjects in which that science was concerned. We have already seen how much Dr Prout had himself contributed to the increase of knowledge in these departments; and the valuable labours of Dr Bright on the subject of diseases in which the urine is albuminous, had powerfully tended not only to elucidate the pathological relations of this condition of the urine, but to direct attention more particularly and forcibly to the pathological signification of the urine in general. During the same period, the influence of the organs of digestion upon the urinary secretion had been more carefully observed, and was more fully understood than previously, chiefly in consequence of the labours of Dr Prout himself; and the extensive and complicated subject of urinary deposits in different states of the system was again by the author subjected to minute and accurate revision. The semeiology of the urinary secretion, in truth, had in the course of eight or nine years acquired so much importance that it constituted as it were a separate branch of research by itself.

All these circumstances concurred to render indispensable greater and more extensive changes in any new edition of the Inquiry than in either of the two first had been requisite. Facts indeed were so numerous and multiplied,—explanations required to be so ample and detailed,—and the whole subject required to be so thoroughly revised and investigated,—that though the materials of the first two editions were still most serviceable, they required to be enlarged by considerable and important accessions. The work indeed was re-written and appeared in 1840, presenting an appearance almost entirely new. The information which it contained was abundant, accurate, and satisfactory; and no other work published during that period can be mentioned as containing so large an amount of new and accurate information on the physiology of Digestion and Secretion, on the process of Nutrition and Assimilation, and the circumstances and conditions by which these functions are liable to become disordered.*

The value of this treatise was enhanced by an instructive introductory discourse, in which the author gave a general view of the ultimate structure and composition of organized bodies; of the alimentary proximate principles; of the nature of the process of assimilation in its primary and secondary stages; of the composition and properties of the blood; of the functions of the liver and its secretions, healthy and morbid; and of the functions of the kidneys and their secretions, healthy and morbid. It would be difficult to mention in the whole range of modern medical literature, any essay more valuable for the instruction which it communicates—whether the novelty, accuracy, the general consistency, and practical results of that instruction be considered—than this introductory discourse. Many of the views, no doubt, had been already given in the third book of the Bridgewater Treatise. But while there, they were physico-theological lessons on the functions of digestion and assimilation, here they were applied in order to explain the morbid deviations incident to the digestive and assimilative functions, and the circumstances under which these morbid deviations were effected. To this latter purpose they were expressly adapted; and hence they were indispensable in studying the several forms of disordered digestion and deranged renal secretion, which formed the subject of the second and third books.

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* On the Nature and Treatment of Stomach and Urinary Diseases. Being an Inquiry into the Connection of Diabetes, Calculus, and other Affections of the Kidney and Bladder, with Indigestion. By William Prout, M.D., F.R.S., Fellow of the Royal College of Physicians. The Third Edition much enlarged. London, 1840. 8vo., p. 483.

It is a remarkable proof, nevertheless, of the slow progress which generalized deductions proceeding from particular sources sometimes make, that the introduction to the third edition of the work of Dr Prout was very little read,—certainly much less than it ought to have been; that the principles which it unfolds were either not understood or were in a great degree overlooked and neglected; and that had it not been published, the effect with a certain class of readers would have been quite the same.

An important accession in this edition was the history which Dr Prout delivered of the various forms of diseased kidney connected with the albuminous and coagulable state of the urine. Between the appearance of the second edition of the Inquiry in 1825, and that of the new treatise on Stomach and Renal Diseases in 1840, Dr Bright had published in 1827 his instructive Hospital Reports, containing, with other important matters, ample and clear illustrations of the several forms of granular degeneration of the kidney; and it is well known to the readers of this Journal how much information was collected and communicated in the course of a few years by various assiduous physicians. Rayer subsequently published in 1839, a very elaborate series of cases, illustrating the anatomico-pathological characters of all the varieties of disease of the kidney; inflammatory, suppurative, strumous, granular and hydatiform. From these two sources, and especially from the copious materials of the latter, Dr Prout drew up an instructive digest of the principal forms of renal disease, in which the urine contains either purulent matter, chylous matter, or albumen; chiefly with the purpose of distinguishing the incurable examples of these diseases, from those admitting of cure, and pointing out the circumstances on which this distinction usually depends.

In this edition Dr Prout, who had long been in the habit of examining urinary deposits by the microscope, gave microscopic views of the principal sediments and distinguished them from each other by well-marked characters.

In the course of the same year, September 1840, appeared the work of Justus Liebig, Professor of Chemistry at Giessen, on Organic Chemistry, and its application to Agriculture and Physiology, and in 1842, the Animal Chemistry of the same aut These performances, with several new and highly ingenious vi presented a few which had been long before given by Dr Pr It would lead to an unseasonable digression to point out all instances in which this species of coincidence may be perceived. merely proper to say that the preliminary dissertation of Dr Pr and, it may be added, many parts of the Bridgewater Treatise, tain statements and deductions which attracted little notice they appeared in the pages of the Professor of Giessen.

In 1843 appeared a fourth edition of this work, in which principal change consisted in the introductory discourse now r tioned being placed at the close of the volume, where, with able additions, it formed a separate book.

After the lapse of five years, namely in March 1848, appe the fifth edition of the Treatise on the Nature and Treatmei Stomach and Renal Diseases.* In this the author introduc great amount of new information which had been collected b Johnson, Mr Simon and others, on the microscopical anaton the granular diseased kidney. It is unnecessary in this pla mention in detail the important inferences to which these m scopical investigations lead; since most of them have been alr placed before the readers of this Journal, in the accounts of memoirs of Dr Johnson and Mr Toynbee, and also the tre of Mr Corfe. Of the fifth edition itself an account was give part of its contents in the seventieth volume; and to that a we must refer readers for details on the merits of these conte It is sufficient in this place to say, that while the character o work had been long established as the production of a phys most profoundly skilled in the different morbid conditions o kidneys and their secretion, the present edition showed, though the sphere of observation of the author had been gr enlarged, the accuracy and diligence with which he observed not been diminished. It is indeed by no means easy for ordir and it may be said superficial, observers to form a just estima the great utility of this work, or of the labour and research quired in the collection and arrangement of its materials. only when the complicated nature of the urinary secretion, frequent and multiplied changes to which it is liable, its rap variable character and the numerous though often slight circ stances on whom these variations depend, the numerous conditi either of the urine itself or of the system at large, which ten invest the inquiry with fallacies, and the acuteness and patience requisite to detect and explain these difficulties, and to reconcile discrepancies; it is only, when all these circumstances are deliberately considered, that a just estimate can be formed of the great value of such a work.

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* On the Nature and Treatment of Stomach and Renal Diseases; being an quiry into the connection of Diabetes, Calculus, and other Affections of the ney and Bladder, with Indigestion. By William Prout, M.D., F.R.S., Fello the Royal College of Physicians. The Fifth Edition, revised. London, 1 8vo, pp. 595.

† Edinburgh Med. and Surg. Journal, vol. seventieth, p. 419. October 184

The research and labour which appear in a tangible form constitute but the smallest proportion of that information which is required to prepare such a work in a creditable manner. Every result required to be established with such accuracy and certainty that all serious error might be excluded. And it is important to remark that, in the progressive stages of his researches, Dr Prout appears to have advanced so cautiously and so correctly, that he did not often require either to retrograde or to depart from the path in which he was advancing. The first steps were, by a rare degree of good fortune or sound judgment, made in the right direction; and any changes or amendments which he found it requisite to introduce, for no mere man can dispense with making changes and amendments, were of a nature so inconsiderable and o subordinate, that they did not affect the great and leading characters of his researches. The third edition of the Treatise presented the expanded and completed views of that which was given mostly in outline in the two editions of the Inquiry. But when we compare the two editions of the Inquiry and the third edition of the Treatise with the two subsequent editions, nothing so forcibly strikes the mind as to observe the large proportion of new chemico-physiological information, the new and original general views which the author presents, and the firmness, nevertheless, with which these views have stood the test of time and the progressive advancement of knowledge. The treatise of Dr Prout must be regarded as the most valuable and serviceable contribution which chemical and physiological research have made to the practice of medicine during the last half century.

The publication of the third edition of the Inquiry was followed, we have understood, with a large increase in the extent of his consultation practice. Dr Prout became, in truth, the principal authority in all those diseases, in which the urinary secretion is affected, either in a primary or a secondary manner. His consultation correspondence became in this manner most extensive; and not only was his advice solicited by patients and practitioners in the metropolis, but from the provinces and from various parts of Scotland letters of consultation were daily transmitted, and patients without intermission applied.

It is a singular though not unintelligible feature in the character of Dr Prout, that he never used the symbols and formulæ so generally adopted by chemical writers, as indicating the chemical composition of various organized substances and the proportion in which their elements are represented to be combined. He had, in short, a distrust, amounting almost to total disbelief, in the accuracy of the numbers assigned; and repeatedly expressed the opinion that these formulæ were, in the present state of science, unphilosophical, and did not represent the true constitution of organized substances. On the correctness of this opinion it would be unbecoming in any one not as able a chemist as Dr Prout to offer any remark; and we believe that the wisest course is to leave the decision of this point to the great arbiter—TIME.

Dr Prout has rendered to the practice of medicine great services, not only by what he has himself accomplished by his own personal exertions, but by the effect of his example on others. Though the difficulty of chemical researches on the functions of digestion and secretion must doubtless have operated in preventing many from attempting the same path of inquiry, yet the example of Dr Prout has brought into the same field several accomplished and able chemists who have laboured assiduously and successfully to promote the progress of this branch of chemico-pathological knowledge. It is necessary only to mention the names of Dr Owen Rees, Dr Golding Bird, and Dr Bence Jones; and Dr Golding Bird, whose work is entitled to high estimation in the eye of the scientific physician, has, in the last edition, recently published, acknowledged in becoming terms the great merits of his predecessor in this line of inquiry.

Of the scientific labours of Dr Prout, little more remains to be said. The time of the consulting physician was now so fully occupied, that little was left to pursue merely scientific researches. Dr Prout continued nevertheless active to the last; and might have been expected according to the usual mode of estimation, to be capable for several years of giving information and assistance on the true causes of human suffering, and the most effectual modes of alleviating them and prolonging the duration of life.

Dr Prout, though never robust, had always enjoyed good health; and for a long series of years those who were most intimate with him, never knew him to be confined to bed even for one single day. Part of this resistance to the influence of corporeal infirmity or suffering was mental, the result doubtless of a certain degree and form of mental firmness; but much of it must have been owing to the circumstance, that he never was affected by any serious disorder which could not be controlled by self-management and dietetic regulation. In the summer of 1849, Dr Prout began to complain, or rather to feel less strong than usual, yet without any prominent symptom. This slight indisposition he ascribed himself to having been overheated by crossing the park on a very scorching day.

In the course of autumn 1849, Dr Prout left town for some time. His pulse was at this time seldom below one hundred in the minute; and though he had no cough, he became emaciated. During the winter he seemed to improve. At the approach of spring 1850, however, a change for the worse became rapidly evident. Yet the disorder appears to have advanced insidiously, as Dr Prout never was entirely laid aside from professional duty; and continued in his wonted course of giving advice and writing answers to letters during the whole course of the month of March and the first week of April. On the morning of Tuesday, the 9th of April 1850, Sir Benjamin Brodie called on him; and then, for the first time, Dr Prout expressed to Sir Benjamin the opinion that he was dying. Notwithstanding the feeling, by which this opinion was dictated, so completely did he disregard and forget his own condition, that after Sir Benjamin Brodie had left him, he proceeded to write directions for those patients, whose cases he apprehended would not be otherwise properly understood. He had even attempted to perform a visit, but was unequal to the effort. In the afternoon the change was manifest; and in the evening Dr Prout breathed his last. The intellect was clear and unaffected. The final symptoms were those indicating affection of the lungs.

No examination of the chest by auscultation had been made during life, nor was there any inspection of the body after death. There was nevertheless reason from the symptoms to believe, that gangrene of the lungs had taken place.

The remains of Dr Prout were interred in the Cemetery at Kensal Green; and by his directions a plain slab is erected to his memory in Horton Church.

Of the intellectual and moral character of Dr Prout it is unnecessary to speak, after the observations already made on his several writings. The character of his mind was that of great precision and accuracy, with much ingenuity in devising the means for obtaining correct results. This predilection for the science of abstract quantity led him to apply it to chemistry wherever this application was practicable; and the elaborate precision with which he determined the constitution of various organic products, as well as the close and consecutive manner in which he deduced his inferences, are indications of a mind naturally logical and averse to all lax reasoning and all extraneous arguments.

With this remarkable predilection for exact science, it is not a little curious that in the same mind was united a decided taste for two of the fine arts, as well as the power of distinguishing in no ordinary degree, what is excellent in both. It is usually thought that the taste and talents for the strict and exact sciences do not go along with relish for the fine arts. Dr Prout, nevertheless, was an excellent judge of painting, and had collected not a few works of the best masters.

PART II.

CRITICAL ANALYSIS.

ART. I.—1. VICHY *et ses Environs, ou Description des Eaux Thermales, et des Sites Pittoresques qui les entourent; avec quelques Considerations sur l'Action Medicale des Eaux; Ouvrage orné avec huit Lithographies.* Par H. LECOQ, Professeur d'Histoire Naturelle, Directeur du Jardin de Botanique de la Ville de Clermont-Ferrand, &c. Paris, Londres, Clermont, 1836. 8vo. pp. 244.

Vichy and its Environs; a Description of the Thermal Waters aad of the Picturesque Situations by which they are surrounded; with some Considerations upon the Medical Action of the Waters (Eight Lithographs.) By H. LECOQ, Professor of Natural History, Director of the Botanic Garden of the City of Clermont, &c. Paris, London, and Clermont, 1836. 8vo, pp. 244.

2. *Rapport sur l'Emploi des Eaux Minerales de Vichy dans le Traitement de la Goutte, lu a l'Academie Royale de Medecine dans sa Seance du* 24 *Mars* 1840, *au nom d'une Commission.* Par M. PATISSIER, Membre de l'Academie Royale de Medecine. Paris, 1840. 8vo, pp. 240.

Report on the Employment of the Mineral Waters of Vichy in the Treatment of Gout. Read to the Royal Academy of Medicine on the 24th March 1850, in the name of a Commission, by M. PATISSIER, Member of the Royal Academy of Medicine. *Followed by an Answer to some Allegations against the Solution of Urinary Calculi,* by CHARLES PETIT, D.M., &c. Paris and London, 1840. 8vo, pp. 240.

3. *Du Mode d'Action des Eaux Minerales de Vichy et de leurs Applications Therapeutiques, Particulierement dans les Affections Chroniques des Organes Abdominaux, la Gravelle, et les Calcules Urinaires, la Goutte, et le Diabete Sucré.* Par CHARLES

PETIT, D.M., Membre de la Societé de Medecine de Paris, et Medecin-Inspecteur-Adjoint des Eaux de Vichy. A Paris, 1850. 8vo, pp. 504.

On the Mode of Action of the Mineral Waters of Vichy, and on their Therapeutic Applications, particularly in Chronic Disorders of the Abdominal Organs, Gravel, and Urinary Calculi, Gout and Diabetes Mellitus. By CHARLES PETIT, D.M., Member of the Society of Medicine in Paris, Adjunct Physician-Inspector of the Waters of Vichy. Paris, 1850. 8vo, pp. 504. (*Continued from Volume Seventy-fifth.*)

THE theory which M. Petit gives on the formation of obstructions and the mode of their resolution, and which readers will find at p. 213 and 214 of volume seventy-fifth, is applicable not only, he assures us, to obstructions properly so called, such as those of the liver, the spleen, the ovaries, and the mesenteric glands, but further and equally well to chronic disorders of membranous organs, for instance, those of the stomach and intestinal tube, because in these last cases, as in the preceding, there is at the same time usually a thickening of the tissues more or less considerable, more or less induration,—in short, a species of obstruction which requires the solvent action of soda. The mucous membrane is commonly the principal and original, but not the exclusive seat of this induration; it is rare that inflammation does not penetrate to the layers of the subjacent tissues. This condition of thickening and induration of the tissues is, as has been demonstrated by M. Andral, a character which pertains exclusively to chronic maladies, or, to speak more correctly, which is in a degree more or less marked an effect almost constant of these maladies. The presence of this thickening and induration is observed in instances of chronic inflammation of the air-tubes, of the mucous membrane of the eye, of that of the urethra, of the skin, of the serous and synovial membranes, as well as of the stomach and intestinal tube, wherever these organs and tissues have been long the seat of this inflammation. This condition of thickening and induration is not always confined in these different instances to the mucous, serous, or cutaneous membranes; it spreads to the subjacent tissues. It may even happen that, after chronic inflammation has continued for a time more or less prolonged, the superficial membrane of the diseased part may recover more or less perfectly the appearance which it possessed in the state of health, while the induration of the subjacent tissues continues. " Thus," observes M. Andral, "after inflammation of the conjun more or less intense, and when this membrane has resume wonted whiteness and transparency, the cellular tissue un it to the sclerotic coat may remain inflamed, infiltrated purulent matter, become thickened, and the seat of dege tion. In like manner, in persons who have originally ha tacks of gonorrhœa, and in whom the canal of the urethra become the seat of stricture, the mucous membrane is f healthy; but beneath that the cellular tissue thickened an durated.

Researches in pathological anatomy have shown the evid of the same changes in examples of chronic inflammation o stomach and bowels; that is, that the inflammatory a which is seated at first in the mucous membrane, is often pagated when it continues long to the subjacent tis especially the two cellular layers, situate the one betwee mucous membrane and the muscular coat, the other bet the latter and the peritonaeum; and that though its effects be more or less completely removed from the mucous r brane, yet various changes may be left in the subjacent tis

In the mucous membrane of the stomach, Andral obse as in that of the intestine, it has more than once been pos for him to follow in some degree the declination of infla tion, to be able to estimate in a manner more or less acc the different transition changes through which the mu membrane passed in order to return from the diseased to sound state. Thus, at the same time that there existe ferent changes in the subjacent tissues, sometimes he foun mucous membrane red, thick, softened, sometimes ulcera in other instances these marks of inflammation of the mu membrane were greatly less evident; it was for example less white; in other instances, in short, it was quite evi from the nature of the changes, that the mucous membrane been greatly less diseased than it appeared to be at the ti which the parts were inspected anatomically. In one inst examined at La Charité along with M. Reynaud, the int surface of the stomach was white in its entire extent; i region of the pylorus there was a manifest induration o submucous cellular tissue with hypertrophy of the mus coat. These tissues as they receded from the pylorus res their natural physiological aspect. Then near the midd the stomach, the parietes of this organ presented a se thickening, a species of cartilaginous hardness. This inc tion was seated only in the different tissues subjacent to mucous membrane. In the whole extent of this thick portion, about equal to the size of a five franc piece, the mu membrane itself was altogether gone. There was formed an ulceration so superficial with white margins, and basis also white at the level of the margins, that at first sight it was not perceived. The basis was formed by the cellular tissue remarkably thickened.

In instances in which the gastric mucous membrane has recovered its normal white colour, its thickness and consistence, while there is still induration of the subjacent tissues, it becomes a question whether in all these instances this membrane has been restored to its normal condition. Though the membrane appears sound, digestion continues to be performed with pain and difficulty, such, in short, as takes place in persons in whom the mucous membrane presents after death marks more or less evident of chronic inflammation. It appears, therefore, that in instances of this nature, the mucous membrane recovers the appearance which is regarded as normal, before it is restored to the healthy condition of its functions; and that the irritation of alimentary articles keeps up a degree and form of the previous morbid irritation.

M. Petit infers, consequently, that the state of thickening and induration of tissues appears to be a necessary and inevitable consequence of every inflammatory action which continues for some time; and in the instance of inflammation of membranous organs, it is not sufficient that the superficial membrane in which the inflammation commenced, should have resumed a normal appearance, in order that its functions may be performed in a satisfactory manner.

In instances of inflammation of the stomach and bowels, in order that the digestive functions may be performed in a perfect manner, it is requisite that the gastric juice must have recovered its physiological properties; and this cannot be done, unless this membrane is modified in its entire substance, and even into the mucous crypts or cells by which the secretion is furnished. All induration in the subjacent tissues, therefore, must have disappeared; all modifications must have been removed, which cannot be effected, especially when the disease is long continued, except by lengthened treatment, extending perseveringly over several years. Unhappily, persons in this state determine to undergo careful treatment at periods of the disease too late. Instead of attempting this, when the disease is commencing and not far advanced, when its removal is accomplished with comparative facility, they wait indefinite periods, continuing to digest with more or less pain, allowing the disease to take root, aggravating it not unfrequently by errors in regimen, always in the hope that time will restore their health. In this manner gastro-enteric disorders, like all chronic distempers end by acquiring so great a degree of severity that they become difficult to be cured; and indurations are formed, which, when too long neglected, become at length the seat of skirrhous affections and different degenerations, against which the resources of medicine are then completely powerless.

Chronic disorders of the stomach and bowels, though all commencing by irritation, and assuming more or less decidedly in their course, the characters of inflammation, are often presented with different symptoms, which so seldom bear any proportion to the severity of the disorder, the changes in structure which evidently ensue, and the susceptibility of the affected organs varies so much in different individuals, that it is not always easy to determine before hand what shall be the result of the employment of the waters. This difficulty is increased by the circumstances of patients repairing to the waters after having suffered long, and tried without success all the ordinary means, and, in short, when the disease is considerable, obscured, and modified.

In order to explain these differences between affections which are seated in the same organs and in the same tissues, physicians have been compelled to admit of prédisposing causes under the influence of which these diseases are formed. To ascertain the fact and the nature of these predisposing causes, M. Petit admits to be an important part of the duty of the physician; but he further maintains that nothing can excuse, the physician, from using all available means to discover the exact organ or organs affected, ascertaining the extent and degree of the disorder, and thus having it in his power to accommodate the therapeutic means to the nature, extent, and degree of the malady.

In general, in all circumstances in which some time has elapsed since the existence of acute symptoms, when the sensibility of the belly is either gone or little marked, and when patients complain no longer of fever, but only of slow difficult digestion, constipation, frequent fits of uneasiness, cramps, or sensations of weight in the stomach, sensations of traction, flatulence in the stomach and bowels, all of which are preliminary symptoms of more severe sufferings, providing this condition is neglected, the use of the waters of Vichy is fully indicated, and generally speaking, from their use excellent results are obtained. But there is no class of affections in which it is so necessary to observe prudence in their administration, particularly in prescribing the drinking of these waters; because in these circumstances their action operates directly on the diseased organs, and as there always remains in this instance a certain degree of susceptibility, it is always necessary to beware of producing too great excitement, and recalling the inflammation to the acute state. Further, as a general rule in all affections of the stomach and bowels, the waters ought never to be administered in drinking in large doses; and occasionally we meet with such forms of susceptibility, that we are obliged to abandon entirely internal exhibition, and to confine the patient to the use of the baths, which happily may then exert an action at once powerful and salutary.

In administering the waters of Vichy as drink, especially in attempting in this manner the treatment of affections of the digestive organs, it is most essential to attend to the habitual diet of patients. This recommendation M. Petit regards as of primary importance, especially since the discovery of the fermenting principles, which are contained in the products of the salivary and buccal secretions, in the gastric juice and in the pancreatic liquor, and since we know the part which these different ferments perform in the principal acts of digestion.

This is not the place to enter into details on the discovery and the properties of these ferments. It is sufficient to remind our readers that M. Mialhe has demonstrated in the salivary and buccal secretions, the existence of an animal principle, which he regards as a ferment, to which he gives the name of *animal Diastase*, and to which he assigns the properties of converting into sugar amylaceous aliments, and of converting them into DEXTRINE and GLYCOSE, a transformation necessary to render these matters nutritious; that the gastric juice which acts chiefly on animal substances contains two principles, one acid, which has the property of hydrating animal substances, and causing them to be converted into chyme, the other, an animal principle,—*pepsine*, which possesses the power of changing the chyme into albumen; and that finally, M. Cl. Bernard has discovered in the gastric liquor another ferment which possesses the power of dissolving fat, and thereby adapting it to be absorbed into the circulation.

Though the mode in which these principles produce their peculiar effects, be not known, yet it is easy to see that it must be most important not to disturb and disorder their action during the actual performance of the digestive functions, by the unseasonable introduction of acid or alkaline drinks. Thus as diastase is an alkaline principle, it is necessary to avoid giving acidulated drinks to patients who make amylaceous articles their chief food; while, on the other hand, as the gastric juice is normally acid, and as this condition seems necessary to the proper transformation both of vegetable and animal aliments, it is improper, as is too often done even at Vichy, for patients to drink Vichy water or any other alkaline drink at their meals or during the process of gastric digestion.

M. Petit further argues, that as in the digestive transformations, and in the incessant operation of the decomposition and renovation of the matter which constitutes the organized body, more acids are formed in proportion as more animal food is used, and less acid is formed according as vegetable food is much or exclusively employed, it follows, that in the former case, that is to say, when animal matters are employed, alkaline drinks will be so much better endured as they are more necessary, and that, in the second case, not being required to contend against an excess of acids, they ought to be administered in moderate doses.

Part of this reasoning appears correct; but part of it is also doubtful. The great excess of hurtful acid is assuredly formed in the stomach, chiefly when an excess of food is taken, whether vegetable or animal, that is an excess in reference to the catalytic powers of the stomach. The first object, therefore, is to diminish the quantity of food taken, so as to bring it within the powers of the organ. If acid be still formed in excess, articles of food after which this excess appears to ensue, ought to be avoided; and all exciting agents ought to be prohibited. If it be then thought that alkaline mineral waters might be beneficial, they should be administered neither immediately nor soon after meals, but at an interval of from six to eight hours after, when it may be inferred the chymous mass has passed into the duodenum; since it is within this organ that the chyme becomes alkaline, and consequently any alkaline addition is less likely to be hurtful than within the stomach. It ought not to be forgotten, nevertheless, that even this mode of administration is at best experimental; and the physician cannot say before the patient has tried this method of procedure, whether it is to be beneficial or detrimental.

Before quitting this subject we feel it necessary to observe, that it seems highly doubtful, whether the use of alkaline waters or mineral waters of any kind be really capable of removing induration of tissues properly so called, and restoring to their normal state any of those changes called induration and hypertrophy, in the gastric and intestinal tissues. It seems much more likely, that the changes which the use of these waters is adequate in any mode to diminish and remove, are venous and general capillary fulness and congestion, affecting in some instances the stomach, in others the intestines, in others the liver, in others the pancreas or the spleen, and in other instances affecting several of these organs at the same time. It is well known that such fulness often takes place in persons who indulge freely in eating and drinking, while they take little exercise; and it is also known, that it may be made to disappear under the use of restricted diet, saline laxatives and similar means, the effect of which is either to empty these vessels or to prevent them from being excessively filled. As to the influence of any medicine on such a change as hypertrophy, properly so called, of the gastric or intestinal tissues, we must acknowledge our incapacity to admit it as a therapeutic fact. At the same time we allow that this amounts very much to a difference in opinion.

M. Petit, however, directs attention to the particular effects of the Vichy waters, of which the following summary is given.

When the disorder is not of long standing, and when patients are found in suitable circumstances, amendment in general fails not to take place. Appetite is improved, digestion is better performed, and strength with the appearance of improved health returns. When the disease is of long standing and the organs have been seriously affected, and when induration of the affected tissues has already continued for a long time, it is not reasonable to expect a result so rapid. It is only some time in these circumstances, and occasionally a long time after the treatment, that patients begin to feel its good effects; and further, in order to complete the cure and render it permanent, it is almost always necessary for them to return and take the waters several years in succession, taking care always in the interval of the seasons to observe a proper regimen, and even further to employ some time the transported Vichy waters. Thus to successful results time and perseverance are indispensable; for it is impossible to accelerate the progress of the resolution, and to attempt such a proceeding might be followed by serious evils; while, on the other hand, if we neglect these maladies, or if they are aggravated by improper regimen, they necessarily advance in the wrong direction. Thickening and induration of the mucous membrane and of the subjacent tissues are increased; and there is developed a process of disorganization, one of those disorders against which neither mineral waters nor any other remedy can make any favourable resistance. This is unhappily the too frequent termination of these maladies when they are not attended to in good season and with the requisite perseverance; and then when they have attained a certain degree of severity, as the symptoms are not uniformly in proportion with this state of severity, it is not always easy to distinguish those cases in which the waters may yet be serviceable, from those in which it is to be feared they accelerate the fatal progress of the distemper. Under all circumstances, when patients apply in similar conditions, if, after exact examination of all the symptomatic characters which may throw light upon the state of the unsound organ, it is not positively demonstrated, that the disease is entirely incurable; if upon this point doubts are left, and in however small a degree we may recognize chances of success, M. Petit expresses the opinion that it is still a duty to make trial of the action of the waters. But in such circumstances, he adds, this trial ought to be made with the greatest caution, and under the condition of giving it up, if after a certain time any bad effect is observed to follow.

This opinion is founded upon facts observed by the author. These were instances of patients who presented all the characters which might lead the physician to suspect the existence of organic disease, in whom all the ordinary resources of medicine had been exhausted without success, and who, after being despaired of, had been recommended by their ordinary physicians to M. Petit. Of these affections in these cases M. Petit was himself apprehensive; for, after attentively examining the patients upon their arrival at Vichy, he partook in all the fears of his professional brethren; and only with hesitation recommended the use of the waters. One of these cases is the following.

A lady of delicate constitution was in 1837 recommended by M. Chomel to go to Vichy for various severe dyspeptic symptoms. Ten years previously she had laboured under violent *gastritis;* subsequent to that period digestion had been performed with pain; and health was never completely re-established. In 1836 the disease returned in the acute state, and fits of vomiting subsequently ensued, and were frequently repeated. She was scarcely able to take twice in the day some spoonfuls of light soup, and these the stomach often rejected. Emaciation was extreme; and the complexion of the patient bore the tint which it usually takes in organic diseases. Upon examining carefully the infra-costal region, when the patient was in the horizontal position, M. Chomel had found on the left of the median line, behind the abdominal parietes an imperfectly circumscribed resisting body, which he also found by making the patient take a semi-vertical position, while placed on a sofa with an inclined back. This led him to infer the probable existence of skirrhous induration of part of the walls of the stomach. This resistance M. Petit readily recognized at the time when the patient arrived at Vichy.

During five weeks which this lady spent at Vichy, she drank the water in small doses, while she bathed in it daily. When M. Petit saw that she endured this treatment, he began to entertain some hope of success. At the end of a short time she digested a little better, the allowance of light soup to which she restricted all her food; and the vomitings soon ceased. She left Vichy with a little amendment. She continued to take constantly at home the transported Vichy water till the month of

July 1838, at which time she returned to the springs. Amendment had then made perceptible progress. She complained little of the stomach and she digested better. She did not, however, take solid animal food, or she took it seldom and very little at a time. She had even repugnance to use it. After remaining one month at Vichy, she returned home, where she continued the same treatment as the previous year, and amendment advanced.

Lastly, this lady returned to Vichy in 1839. No trace was then recognized of resistance in the hypogastric region, which had been felt before the use of the waters; and she began to digest with facility a little animal food. Since that period, though the patient is still obliged to be watchful over her regimen, and to be guarded in all respects, the symptoms which led the physician to suspect a skirrhous disorder of the walls of the stomach have disappeared, and her health, though not perfect, is at least very tolerable.

In another instance which is given, a military officer, who had long served in Africa, and had become much emaciated under constant vomiting, but without perceptible induration or resistance, after two months use of the waters, but in very minute doses, with long intervals interposed, a weak bath daily, and restricted diet,—got rid first of the vomiting, and then began to digest, and finally recovered a certain amount of strength. This patient returned from the frontier of Morocco on the 28th May 1838 to Vichy; and he was then plump and strong, but continued the use of the waters with increased benefit. He returned a third time on June 25th 1849, with symptoms of digestion a little more uneasy than ordinary; these symptoms disappeared under a third course of the waters, and the patient went away in good health.

In affections of the liver the Vichy waters have long had a high reputation as therapeutic agents; and the reputation M. Petit thinks better merited by no remedy. In chronic inflammations of this gland, with more or less increase in its volume,—in jaundice, with or without hepatic colics,—and in all obstructions of the biliary passages,—he thinks it may be truly said that these waters work miracles.

He first notices their influence in chronic disorders of the liver, with more or less enlargement in the volume of the gland.

These enlargements may affect either the whole liver or one part. The latter are the most common; and the left lobe and the part contiguous to the gall-bladder are the points most commonly found enlarged, at least in the patients who resort to Vichy.

In some cases the organ scarcely exceeds the margin of the ribs; in others it descends lower down. In certain cases it is felt in the hypogastric region. In general it is easy, by attentive examination of the abdomen and the lower region of the right side of the chest, compared with that of the left, by means of palpation and percussion, when the observer possesses the habit of this species of exploration, to judge of the volume of this organ and of the degree of its induration. This estimate is sometimes difficult only in certain patients, who, on the slightest touch of a strange hand, involuntarily throw the abdominal muscles into tension, in persons very corpulent, and in instances in which the affection of the liver is complicated with the effusion of more or less fluid within the peritonæum.

The severity of swellings of the liver is not always in proportion to the volume and extent of these obstructions; for this organ may be very seriously diseased, while the volume is not increased. In all cases of enlargement it is requisite, in reference to prognosis and the results which may be expected from the action of the waters, to distinguish between those instances of enlargement which are without increased consistence of the liver, those which are associated with induration, more or less well-marked, of the gland, and those which are accompanied with softening, more or less extensive, of its tissue.

In general, whatever be the size of the liver, when it has retained its natural shape,—when it offers no inequalities or elevations,—when its surface is not traversed by very hard points, beside others more or less softened,—when, in short, there is no change in texture, no hydatiferous sacs, tubercles, or marks of cancerous affection, there is every reason to believe that, with perseverance in the treatment, the waters of Vichy will restore the organ to its natural volume. The following example of this species of restoration is given.

M. H., architect, residing at Paris, had three attacks of bronchial catarrh at the age of sixteen; yet without much affection of the constitution, which was very strong. At the age of twenty-one, in consequence of a public competition which required much application and several nights spent without sleep, he had a violent attack of dysentery, which weakened him so much, that, having fallen one day in his chamber, he spent several hours in the same position without recovering sufficient strength to return to his bed-chamber. This dysentery disappeared; but it was followed by acute pains in the urinary passages, especially towards the prostate gland and the region of the kidneys. He voided blood at several times, and afterwards followed a mucous discharge, which could be ascribed to no venereal cause, and which was, like the renal pains, very obstinate, notwithstanding that the most suitable means were employed to subdue it.

All these symptoms, nevertheless, disappeared so completely, that they never returned during the course of a fatiguing journey which he made into Italy and Sicily, and which occupied two years.

On his return to Paris in 1828, being obliged to change entirely his manner of living, and to devote himself to sedentary work, he lost sleep, and digestion became laborious. He caught a catarrh, which, though not violent, lasted six months and then left him much exhausted and emaciated. Not only had he been obliged to renounce the habit of smoking, but he could not feel the smell of tobacco without suffering violent cough; and the same result followed if he took the smallest quantity of pure wine. Having afterwards undergone severe domestic crosses, sleep abandoned him almost completely, digestion became still more difficult; and after the occurrence of pains in the right side and a sense of deep constriction in the hypochondrium, it was perceived that the belly had become hard and doughy, and that the volume of the liver had considerably increased. The complexion, which was yellow, allowed to be perceived red spots on the right cheek. Smart itching feelings in the skin, uneasy feelings and cramps in the legs, especially the right, ensued. The patient complained of a continual insupportable metallic taste in the mouth. He had acute pain between the shoulders and in the region of the kidneys, the latter of which were so violent that they obliged the patient to keep almost constantly in bed. Most commonly he could walk only by having the hand strongly pressed upon the flank, as if to give support to the liver. At every moment of the day, especially after meals, bile came up, he stated, into the mouth, as if it had been squirted up by means of a syringe. While in bed he suffered very acute pains, which passed suddenly from the liver to the side occupied by the spleen. Every night he had spermatic discharges, scarcely induced by dreams, and profuse sweatings, whereas, he stated that he had never perspired during his whole life. Lastly, the voice was broken and respiration short and extremely painful, especially when he was obliged to ascend a stair. Leeches repeatedly applied to the anus, baths of every kind, cupping glasses, blisters, setons had all been employed with little manifest good effect.

This patient was in a deplorable condition when he was brought on the 15th of June 1834 to Vichy by his physician, M. Pinel-Grand-champ. The liver at this time occupied the whole right centre of the belly and extended a little into the left side; it projected above eighteen lines; it was as hard as marble and descended to the groin. The body was everywhere extremely hard and tense; and the circulation was so much impeded in the vessels of the interior, that the veins of the skin were as large as the finger. This condition had been ascertained before the patient's departure for Paris by several physicians beside M. Pinel-Grand-champ, and amongst others by MM. Rostan, Vareliaud, Hippolyte Petit and Salone.

He endured the journey greatly better than he had hoped. During the first three nights which he spent at Vichy he was unable to lie down; and he spent them seated in bed wrapped in a covering. When laid on the right side, pressure in the region of the liver caused him to suffer; and when he placed himself on the left side, it seemed then that the liver was adherent to the ribs, and that left in this position to its own weight, it was ready to produce laceration.

The first day he took a bath with only one-third of the mineral water, and he drank two glasses of the water of the Spring of Grand-Grille. At first the patient was unable to go from the bath to the thermal establishment, though the distance was very small, without resting at least three times. The quantity of water for drink, as also the proportion of mineral water for the bath, were gradually increased; and strength, appetite, and sensation of amendment increased in the same proportion. Eight days after his arrival he was able to go to the thermal establishment without sitting down. He drank daily some glasses of the Grand-Grille spring water, and took a bath of pure mineral water. The first bath of pure mineral water which he took caused profuse salivation; which, however, soon ceased.

Having observed that the mineral water, in acting on the liver, acted at the same time on the bowels, causing in them pains, and having remarked that the spermatic discharges almost always took place about five in the morning, the time at which he was usually in sleep, he determined to rise at break of day and go to bed regularly between eight and nine in the evening. In the morning, after drinking the waters and taking the bath early, he returned to his chamber and took an enema nearly cold, and retained it for one hour, observing the horizontal position. By this means the intestinal pains and the discharges completely disappeared.

The amendment continued with little interruption. The treatment was continued for two months, with only two intermissions, when the patient felt himself entirely saturated by the waters. This condition was in him evinced by a sense of general fatigue, a little sensibility in the region of the liver, some repugnance to the water in the form of drink; and a sense of stiffening in the left arm, which seemed to him cold, and in which he felt a continual prickling.

On the fifteenth day of the treatment the patient took two baths of the pure mineral water and eight glasses of the Grand-Grille spring. He ended by taking every day during the last month ten glasses of the Grand Grille water, two baths of pure mineral water, two douches, and he drank at each meal one litre (equivalent to 1.76 imperial pint, or 2.11 wine pints English) of the Celestins Spring. He took also for some time an enema of the pure mineral water.

At his departure, which took place on the 30th of August, the appetite was good; he digested well; the abdomen seemed almost entirely free. There was no metallic taste in the mouth; no more pains in the kidneys; the legs had recovered much of their strength; and the volume and hardness of the liver were greatly diminished.

M. H. passed some months in Champaigne, where the liver continued to diminish in size. There he lived soberly, made great use of ripe grapes, took much exercise on foot, and particularly upon the mountainous parts; he desired even to labour on the land. By following this regimen, he was capable at the end of November of following a stag-hunt on foot for about twelve leagues, the length of which he estimated by nearly continual walking from six in the morning till six in the evening, without being seated for one instant.

M. Petit saw this patient at the end of December in good health, with restored colour, and the plumpness and strength of a healthy person. The liver had at that time diminished considerably in size since his departure from Vichy; yet it was not entirely reduced to the normal size. Some time after his return he felt not quite so well; he was easily fatigued, and he was unable to drink pure wine, even in very small quantity, without inducing irritation in the chest. His complaints, nevertheless, had nothing formidable. He continued to observe temperance, and during the spring he drank for some weeks the transported Vichy water.

M. H. returned to Vichy on the 1st of July 1835 in a state of health very different from that in which he was the previous year. After the most careful examination M. Petit could find nothing, or next to nothing, of the former great enlargement of the liver. The patient forthwith began treatment somewhat active, which he bore perfectly. He was so well, and the liver appeared to be in a condition so good, that M. Petit allowed him to depart after remaining one month at Vichy.

M. Petit expresses the opinion, that the prompt and complete resolution of an enlargement so considerable is mainly to be ascribed to the circumstance that the patient, instead of taking the waters the first year only for three weeks or one month, took them for two months and a half, and further, to the fact of his enduring a large quantity of the water both externally and internally, and which maintained constantly a high degree of alkalization. The moral constitution of this patient was also excellent, and doubtless contributed to the favourable result.

Though a yellow colour of the skin, and sometimes complete jaundice, ordinarily attend enlargements of the liver, yet these symptoms are not constant; and considerable enlargements are observed, in which the colour of the skin is in no degree altered. M. Petit thinks that this character is not of great importance.

Hepatic enlargements are often complicated with affections of the stomach and the duodenum. Such enlargements are indeed only one consequence of these last maladies when long continued. When the symptoms indicate the presence of this complication, the physician ought to give the gastro-duodenal disorder the most serious attention, and so long as it continues, the treatment for the hepatic enlargement cannot be conducted with the same activity as might be proper, if the liver alone were diseased.

The complication of effusion of water within the peritoneum is always an unpleasant circumstance; it does not, however, form a complete obstacle to the employment of the waters and the success of treatment. In some instances, after removing, by the employment of the waters, the hepatic enlargement, which is often the cause of dropsy, the latter disappears, or, at least, the chances of success with parakentesis are greater.

Madame A. of Bressuire (Deux-Sevres), aged fifty-one years, came to Vichy on the 25th of June 1837. Menstruation had begun to be deranged six years previously; and for seven months it had completely ceased. For several years digestion was accompanied with pain; the stomach could endure only certain sorts of food, and this in small quantity; yet she digested some heavy articles when the stomach had desired them. The skin was discoloured; the colour yellowish, variable. Constipation was habitual. In the state of repose the cardiac beats were regular, and presented nothing abnormal; but on the slightest movement, she felt well-marked palpitation, and complained of oppression.

M. Petit ascertained the fact of considerable swelling of the liver, but without great hardness or inequalities. The gland exceeded the margin of the ribs in its entire extent about four inches. The whole belly was swelled, and presented, especially in the hypogastric region, and in the flanks, fluctuation well marked. All the lower extremities were œdematous.

M. Petit thought it not eligible in this case to recommend the use of the baths. He advised the patient to remain constantly in the horizontal posture, in order to favour as much as possible the circulation, and to prevent the increase of the dropsical effusion. In this manner, without quitting her bed, the lady made use of the waters in drink for more than one month. After this time she appeared a little better. Digestion was amended, and the liver appeared to be diminished in size. But œdema of the legs continued, and the water within the abdomen was unaltered.

After returning home, and in the course of some months, the amendment made very remarkable progress; and when this patient returned to Vichy on the 27th June 1838, there was neither œdema of the lower extremities nor water within the abdomen. The enlargement of the liver had greatly diminished; the patient had some appetite; digestion was better; and the colour of the skin was clearer. This year, besides drinking the mineral water, this patient was able to take some baths. At length her health was quite re-established; and continued so.

In a third instance of a lady of fifty, in whom, with pain in the right hypochondriac region, much watery effusion within the abdomen, there was reason to infer the existence of hypertrophy of the liver, the internal use of the waters for some weeks, and their subsequent use at Paris, was followed by diminution in the size of the abdomen. The second year, 1842, when the patient returned to Vichy, the baths were employed without much effect on the dropsical swelling. Parakentesis was then performed twice, and after the second puncture the watery effusion did not return.

This lady returned to Vichy again in 1843; and, although she had sustained some injury in her journey thither, by the upsetting of the carriage, there was no return of the dropsy, the liver was only a little larger than natural, and the general health was in a satisfactory state.

This patient had a return of the hepatic disorder in 1844, with œdema of the lower extremities. The waters of Vichy were again tried with some benefit; but two years subsequently the hepatic disorder made further progress, and death ensued.

Next come Jaundice and Hepatic Colics, or those acutely painful affections that arise from some spasm and occasionally obstruction of the biliary ducts.

Jaundice, though not a constant symptom of affections of the liver, is an accompaniment in many cases. It further takes place in persons in whom there is no other symptom of affection of the liver, or of any other organ so that, were such persons not yellow, they would not be regarded as patients.

The causes usually assigned for the occurrence of jaundice are well known. The most perplexing case is when there is no adequate mechanical obstruction; for instance, when the disease follows a mental affection. To explain the occurrence of this form, it is proposed by M. Petit to have recourse to the hypothesis of Andral, that the liver, altered in its texture or in its functions, ceases to separate from the mass of blood the materials for the bile, which are believed to exist in that fluid; in other words, what is called non-elimination.

In adverting to the importance of knowing in what condition the blood is found when bile is thus mingled with it, he notices the observation of Hunefeld, that *biline* dissolves the globules of blood, and the assertion of Werner, that bile added to the blood causes the solution of the red colouring matter in the serum. He gives, nevertheless, no precise information on the point.

He then adverts to the physiological properties of the bile and the part which it performs in digestion, the merit of fully explaining which he assigns to M. Cl. Bernard after MM. Leuret and Lassaigne. This is, that M. Cl. Bernard showed on the 11th January 1850, that the bile alone has the faculty of preventing and arresting fermentation; that at the moment when the alimentary articles, which are in a state of fermentation in the stomach, pass into the duodenum, the bile precipitates the *pepsine* and immediately stops fermentation. It further aids in joining with the pancreatic liquor in dissolving the fat, which is then absorbed by the lacteals and conveyed into the general circulation.

This representation appears not to our understanding quite just. That M. Bernard has made some instructive discoveries regarding both the bile and the pancreatic liquor must be allowed. But we think that there is not evidence to show, that he was the first that taught that the bile has the property of arresting fermentation. This has been long maintained in this country, we think as long ago as by Dr Coe and Dr Fordyce; and we think further that it was proved pretty clearly by Tiedemann and Gmelin, and also by Dr Prout. Many physiological authors have certainly represented the bile to be a bitter saponaceous compound, capable of arresting fermentation in the chymous mass; and most physiological physicians have in instances of dyspeptic disorder, in which the bile was believed to be defective or inert, attempted to aid its powers by the administration of bitters and alkaline medicines.* It is scarcely necessary to do more than mention the alkaline mixture of chamomile, the combinations of quassia or calumbo with soda or potash, the combinations of rhubarb with soda, aloes with soap, and other compounds of similar characters.

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* The old experimenters all agreed in considering the bile as a kind of soap composed of caustic soda, and a peculiar bitter green resin, which could be precipitated by acids, and in supposing that the saponaceous substance was mixed with the bile in a certain proportion. It was also considered as containing a portion of albumen, which could be separated by alcohol. THENARD, however, showed that the bile contained, besides this resin, a peculiar bitter-sweet matter in form of an extract, to which, from its taste, he gave the name *picromel*, and which, together with the alkali, contributes to hold the resin dissolved. Some circumstances in the experiments of THENARD, which appeared rather impossible, made BERZELIUS undertake an analysis of the bile, and the result was the discovery that no preceding chemists had properly ascertained the composition of the liquid.

Independent of this, however, we feel it impossible to assent to the doctrine that such agents as salivary diastase, pepsin, biline or taurine, and pancreatine, are to be considered in the light of ferments. This idea conveys a most erroneous notion of the nature of these agents. Instead of being ferments they are animal principles, with properties, there is every reason to believe, calculated in the normal state to prevent and repress fermentation properly so called. Every thing known regarding them shows that, so far as they are known, they exert on alimentary articles, a reducing, catalytic, assimilating, and animalizing power; and that their principal duty is first to reduce or break up, as it were, the elementary principles of the alimentary articles, and then, by arranging these principles in a new order and form, to assimilate and appropriate them, or fit them for assimilation and appropriation by the animal and organized tissues. If these agents were denominated *assimilants*, or, in the case of animal bodies, *animalizants*, the denomination would make a much nearer approach to the function, without conveying or implying any idea calculated to lead to error.

We must, however, return to the author.

If the bile, he argues, did not fulfil this important function, if the fermentation, we must protest against the use of this term, if

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BERZELIUS found that bile contains no resin whatever; that it has the same proportion of alkali (soda) and salts as the blood; and that it contains a peculiar matter of a bitter and afterwards somewhat sweet taste, which possesses characters in common with the fibrin, the colouring matter and the albumen of the blood, from which it is formed in the bile. BERZELIUS found also that with mineral acids it forms a peculiar substance not easily soluble in water. With an excess of acid it is completely precipitated, and has all the characters of resin; namely, is soluble in alkohol, melts in heat, and forms with oxide of lead a composition like plaster. —Berzelius' View of the Progress and Present State of Animal Chemistry, p. 65 and 66. London, 1819.

The notice of the bitter-sweet matter here mentioned should be compared with the saccharine matter since mentioned by M. Cl. Bernard to be found in the liver, and obtained from cutting the organ in pieces.

The bitter taste of bile with something like sweetness was also observed by Dr George Fordyce.—A Treatise on the Digestion of the Food, by George Fordyce, M.D., F.R.S. London, 1791, 8vo, p. 69.

The idea of Fordyce was that the mucilage, by which he evidently meant the albuminous and animalizing part of the bile, was decomposed in the duodenum, and the resinous part evacuated. This idea was, whether right or wrong, adopted by Blumenbach and many others.—Institutiones, Sectio xxv., § 387. Editio 4tali. Gœttingæ, 1821.

Berzelius subsequently remarks, that though the change which the bile undergoes within the duodenum is unknown both in nature and purpose, yet it is decomposed, being no longer met with as bile; but the substances containing the peculiar matter of the bile changed into a kind of yellow or greenish adipocerous fat.—View, &c., p. 71.

the *catalysis*, which takes place in the stomach, were continued in the intestines, severe disorders in digestion would follow, as tympanitic distension, borborgymi, colics, diarrhœa, &c., as M. Cl. Bernard states, results from tying the *ductus choledochus*. But this function of the bile is so important, the consequences of its suspension would become so promptly fatal, and the organic textures themselves watches over it so assiduously, that when a ligature has been placed on the duct, the bile finds for itself a new passage into the duodenum. It proceeds at first in a small amount by means of infiltration, and usually at the end of four or five days an artificial canal is formed.

Bile may vary very much both in quantity and in physical and chemical quantities; and it is probable that in quantity it never varies without more or less change in these qualities. When the secretion is augmented, which it is liable to be, it constitutes morbid conditions, to which the different names of *polycholia*, *hepatic flux*, *hapatirrhoea*, and bilious diarrhœa are given. In other circumstances its secretion is more or less diminished; and nosological authors have applied to the affection the name of *oligocholia*. M. Petit states that, though in ordinary circumstances alkaline, it may, nevertheless, become acid.

The most important change to which he directs attention, is that change in the secretion, the result of which is the formation in the biliary passages of gravel or concretions, which, before they areexpelled, often induce those critical and very painful efforts of the system which are known under the name of hepatic colics.

The causes of the formation of these concretions are, like those of most other concretions, involved in considerable obscurity. It only is known that in youth they are rather rare; that it is usually towards the age of thirty or forty years that they begin to be developed; that they are more frequent in females than in males; and that they are common in the aged. Sedentary habits, prolonged use of the bed, indoor life, repeated watchings, and in general all the conditions which may retard the course of the bile, appear to favour their development. Obstruction of the ducts is also a powerful cause of the same result.

It has been long observed that a regimen too highly amimalized determines at length the formation of these concretions,—that they are more common in winter than in summer,—that they are frequently co-existent with calculi which are formed in the kidneys and bladder, as well as with gout. In these different circumstances, therefore, their formation may be ascribed to an excessive proportion of acidity in the economy. The effect of a sedentary life, especially in cold moist seasons, is to impair the functions of the skin; and then the acids are not promptly and adequately eliminated, and remain within the fluids. The co-existence of gall stones with urinary calculi and with gout shows that in all probability both are developed under the influence of uneliminated acids. It is a matter of fact, that some drops of acid added to the bile, not only cause coagulation of its albuminous principles, but at the end of some hours separate cholesterine and the fat acids. From this circumstance, M. Fauconneau-Dufresne thinks that it is quite possible to explain, by the operation of acid reaction, which may affect the bile, the deposit of a small quantity either of colouring matter or of fat matter, and, in short, the beginning of the formation of concretions.

That the bile does actually become acid, and then acquire an increase in density, he infers from the following fact. A patient under the care of M. Chomel died with fatty liver. The gall-bladder was filled with blackish-green bile. Its density was 1046·15, and it strongly coloured turnsol paper. This bile, therefore, presented a reaction acid rather than alkaline. It allowed to fall down very numerous granules colouring matters of deep green. Ether mixed with this bile floated on it, received a feeble tint of yellow, and left by evaporation an acid oil.

The formation of biliary concretions is so much more easy to be understood, however slightly the reactions of the bile are modified, by this circumstance, that microscopical researches made by M. Bouisson of Montpellier, show that the colouring matter is not entirely dissolved in the liquid; that part of it is naturally precipitated; and further, that cholesterine, which was believed, according to the observations of Chevreul, to be in solution, is only in a state of suspension in the bile. From all these considerations, M. Petit adopts the views of M. Fauconneau-Dufresne, in recognizing the fact, that the materials of which gall-stones consist, exist already formed, though in an isolated state, in the gall bladder; and that the minute grains or portions of bile may be considered as microscopic gall-stones, or gall-stones in the rudimentary state. If all this be correct, it seems more wonderful that gall-stones are not constantly and always formed, considering the modes in which mankind live, and eat and drink, than that they are formed so rarely.

Gall-stones are variable in size, figure, and number. When large, there may be one only or two; when small, and in number three, four, or five, they always have facettes, and are tetrahedral or polyhedral, in consequence of mutual attrition. When very numerous they are round, orbicular, globular, and polyhedral or irregular.

They differ also in organization. Many patients void only a sort of gravel or fine sand like the colour of bile, and which, in truth, is merely bile inspissated in minute granules. M. Petit has seen these grains voided in considerable quantity after hepatic colics. One instance took place in a patient aged sixty-five, who was at Vichy in 1844 and 1845, and who laboured under very violent and frequent attacks of hepatic colic, with severe gastro-duodenitis previous to the attacks of colic. The grains which the patient voided are so small and minute that it is impossible to number them.

He asks if it is to be this form of gall-stone that ought to be referred the concretions exceeding in number one thousand, which in the testimony of Baillie are perceived in the collection of Hunter, the one thousand four hundred and fifty recorded by M. Bouisson, the sixteen hundred by Parè, the two thousand of Storck, the three thousand six hundred and fifty-six of Furk, as well as the fifteen grammes of black powder mentioned by M. Fauconneau-Dufresne.

True biliary calculi which possess a certain definite organization are usually ash-grey in colour, or greenish brown or black, and more rarely completely white.

Gall-stones are almost entirely formed of cholesterine and different proportions of colouring matter. In some instances the colouring matter predominates. The white and nearly transparent gall-stones above mentioned consist of cholesterine almost alone. They may contain from 80 to 98 per cent. of this principle.

In studying the structure of gall-stones the observer may usually distinguish three parts; 1st, cortical or exterior layers; 2d, a middle or striated portion; and 3d, one or more nuclei or central portions.

1. The cortical layers are almost always present. Nevertheless, they are sometimes so thin in certain cholesterine concretions that it is not easy to distinguish them. Usually being almost entirely constituted by the colouring matter of the bile, their colour is of a deep brown, sometimes black. In cholesterine calculi, in which they are white and almost transparent, the cortical layers are formed of cholesterine.

2. The middle or striated portion is embraced between the nucleus and the cortical layers, and it appears most commonly under the form of radiated striae, generally disposed in thin triangular plates, converging from the circumference to the nucleus. They are brilliant, of crystalline aspect, and present an agreeable outline.

3. The *nucleus* which is uniformly present is usually formed of colouring matter impregnated with bile, and united to mucus; or it may consist of mucus inspissated, or of a small clot of blood. Such is the nucleus in one gall-stone examined by M. Bouisson. Though single in small concretions, there may be two or more nuclei in larger ones.

For the description of the symptoms produced by the presence of these bodies in the ducts, readers must consult the work itself. These symptoms are in many instances similar to those of iliac passion, with an admixture of the signs of *enteritis*.

Gall-stones may be voided from the system in three modes; by vomiting, by stool, and by working for themselves a passage through the abdominal parietes.

Instances of gall-stones expelled by vomiting are not very frequent; and the author gives the following example in order to demonstrate the fact and the mode of its accomplishment.

M. M. of J., a Portuguese of elevated rank, after having occupied in Portugal one of the highest offices of government, and having been obliged to expatriate himself and his family under the government of Don Miguel, was attacked, after some years of exile and all sorts of sufferings, with very acute hepatic colics, which were almost always followed by more or less deep jaundice of the skin. This patient further presented all the symptoms which usually attend this disorder. He was recommended to come to Vichy, which he did in July 1840. The left lobe of the liver presented some sensibility to pressure, and slightly advanced beyond the margin of the ribs. Very acute pain was excited in a very circumscribed point of the region occupied by the gall bladder, where was felt very distinctly, on sinking the ends of the fingers deep, a swelling possessing nearly the volume and the shape of a very small hen's egg.

This patient M. Petit subjected to the use of the waters internally and by bath; and he was able to take, by progressive augmentation, to the amount of from ten to twelve glasses daily. After three weeks of regularly-conducted treatment, which was also well borne, he was suddenly attacked with acute pain in the epigastric region, along with repeated fits of vomiting of a copious greenish liquid.

After two basins full of this liquid had been emptied, the patient, in a short interval of tranquillity, was able to direct the attendant to examine the matter vomited, stating that he felt something hard which ruffled the throat. The basins had been emptied in the pits, and the matters afterwards ejected only could be examined. In these were found six biliary concretions with facettes, of a colour slightly deep, and the largest of which was of the volume of a nut.

The vomitings continued accompanied with most violent spasmodic pains felt in the epigastric region, and in that of the back below the right shoulder. Little interval ensued between the crises; and in these intervals the patient was distressed by incessant hiccup. This state of suffering lasted, almost without intermission and with occasional aggravation of the symptoms, for eleven days in succession. All the usual means of relief were tried with little avail, and the only thing which seemed to procure a few minutes of repose was keeping constantly in the mouth morsels of ice. The quantity of matters vomited was very great. The bowels were never once moved, notwithstanding the use of several enemata.

Notwithstanding the violence of this hepatic colic, the complexion was only slightly jaundiced; but the features were deeply altered, and emaciation of the entire person was considerable.

M. Petit thinks it probable that, besides the six gall-stones preserved, others must have been expelled and thrown out without having been examined. The alvine evacuations when re-established, which took place some days after the crisis, were not examined.

Notwithstanding the exhausted state to which the patient was reduced by this attack, he rapidly recovered strength, and, after fifteen days of rest and proper regimen, he returned to Paris quite re-established. The patient continued by direction the internal use of the Vichy waters. The winter passed over without any return of critical symptoms, and without derangement of health; and he returned to Vichy and used the waters in the summer of 1841. This gentleman continued for seven or eight years at Paris in good health, though at an advanced age. He then returned to Lisbon, where he died in 1849; though M. Petit did not learn whether death was connected with the presence of the original disorder or not.

Gall-stones may open for themselves a passage either internally or externally, which M. Petit calls artificial. By this he understands that in the first case either the *ductus choledochus,* unable to be sufficiently distended before a large concretion, is rent by the latter in its course to the duodenum; or, in consequence of the inflammation produced by these crises and the presence of gall stones, adhesions being established between any given point of the receptacle or biliary ducts and the duodenum, or frequently the colon, there is established a fistulous communication which allows these concretions to pass directly into the intestinal canal. It is impossible, he remarks, to explain in any other manner the escape by the bowels of those large concretions, examples of which are occasionally seen in patients, whose health is then promptly re-established. These must be regarded as favourable results, because the gall-stones are too large to traverse the natural passages; and if, instead of getting into the intestinal tube, they were to pass into the peritoneal cavity, the result would be inflammation speedily fatal.

In the second order of cases, in consequence of inflammation of the gall-bladder, and adhesion between it and the abdominal parietes, the gall-stones come to the surface, and causing suppuration of the muscles and integuments, are expelled by external opening. These cases, M. Petit thinks, are still more favourable, because it is the most desirable object, when inflammation of this nature advances to the formation of an abscess. This may possibly be the case. This mode of termination is nevertheless not very frequent, and certainly not nearly so frequent as that by passing into the intestinal canal, whether by ulceration of the intermediate organs or not. Of this termination the following example is given.

Several years successively M. Petit attended at Vichy a lady, in whom the gall bladder distended by gall-stones was opened externally in consequence of inflammation by which it had been attacked. By this opening the patient discharged a very great number of gall-stones of a deep colour, and some of which were very large. When she first came to Vichy, the opening left fistulous furnished bile in large quantity. The patient was obliged to change almost continually the napkin with which she covered the opening, as with a sponge, in order to absorb the liquid which issued from it. The liver was swelled and advanced beyond the ribs several inches. There was felt behind the abdominal walls and all round the region of the gall-bladder a sort of very considerable indurated mass, which seemed to adhere to the part of the walls at which the fistula appeared. Notwithstanding this large discharge of bile, the general health of the patient was not bad; she did not complain of the digestive actions which proceeded, she stated, nearly as in health; and the bowels were easily moved.

After a long season spent at Vichy, the liver, having diminished in volume, especially the hard mass which was felt behind the fistula, and the natural channels for the bile being probably at the same time de-obstructed and re-opened, the fistula was closed; so that the following year, when the patient returned to Vichy, not one drop of bile escaped by this passage.

In all cases of jaundice and hepatic colic, excepting the neuralgic hepatic colic of M. Andral, which is probably hypothetical, if not apocryphal and imaginary, the waters of Vichy he pronounces to be certainly the most efficacious remedy that can be employed.

The author enters into various explanations of the solvent and resolvent power of the Vichy waters, as peculiarly adapted to cure these disorders. If, he says, jaundice is connected with enlargement and congestion of the liver, then, by their action on the blood and vessels, they remove this enlargement and congestion, and consequently the jaundice. They act on the bile by augmenting its alkaline condition, and rendering it more liquid, they facilitate its circulation. They maintain the colouring matter in solution; they prevent this from being deposited, consequently, in the form of *nuclei;* while this is prevented from occurring, cholesterine cannot be separated from the bile to form gall-stones. This separation and precipitation of cholesterine is, in truth, the great thing to be obviated and prevented; for when it is once separated from the bile and concreted, as it is not saponifiable or soluble in alkalis, the latter can no longer exert any action upon it.

A question of great importance, accordingly, comes under consideration; namely, whether alkalization, more or less marked, which may be communicated to the bile, may not in some instances have a certain effect upon the gall-stones already formed. When, for instance, these gall-stones contain a greater or less proportion of colouring matter, and *a fortiori*, when they are altogether formed of colouring matter, is it not possible for them to be attacked by a bile highly alkalized, as may be the case, under the influence of the Vichy waters? He deems it not unreasonable to think, that the colouring matter might thus be softened and the concretions consisting of it might then be disintegrated, broke up, and dissolved. One instance of the kind M. Petit thinks he has observed.

A lady from Havre, belonging to a family in whom diseases of the liver are common and hereditary, came to Vichy in 1838, after having had for several years symptoms of liver disorder, and after frequent attacks of hepatic colic. The region occupied by the gall-bladder and all the surrounding parts was greatly more sensible than ordinary; and it was not easy to determine the exact condition of the liver. She took the water for six weeks, but cautiously, on account of the sensibility felt in the region of the liver. Towards the end of the course the side was a little less tense and less painful than at the time of her arrival. She was in short, relieved but not cured. A short time after her return home she suffered attacks of very acute hepatic colic, and she caused to be examined carefully as had been advised, the matters discharged by stool. A large quantity of a sort of *debris* of a deep colour was collected; and in this were seen with other matters found in the intestine, distinct fragments of gall-stones possessing the usual chemical characters, and which seemed to have been produced by a species of braying action.

This lady returned to Vichy in 1839 in a satisfactory state; and she has since continued in good health.

As, however, gall-stones most frequently consist at least in great part of cholesterine, which is not liable to be dissolved by alkalis, it results that these bodies are usually expelled entire without any change appreciable on their surface. All that there can be effected by the Vichy waters, is to induce sometimes those critical attacks by exciting the biliary passages to rid themselves of the gall-stones which they contain; because in this case they can have no other curative effect than that of modifying the secretion of bile, of bringing it back to its normal state, and by this means preventing the formation of new gall-stones.

The author adduces several instances showing the power of the waters in inducing these critical attacks, and though causing much immediate suffering, yet furnishing the means f establishing a better degree of health.

The Vichy waters are also strongly recommended as means of diminishing enlargements of the spleen.

It is scarcely necessary to say, that it is not in cases in which there is pain in the seat of the spleen, but only hard swelling, that these waters are recommended. It is also against recent attacks and those of short duration, that they can be employed with much hope of success. In such circumstances, that is, when the enlargements have came on shortly after fever, the alkalization of the blood by means of the Vichy waters, he conceives, is likely to produce great benefit.

The next disease in the treatment of which M. Petit recommends the employment of the waters of Vichy is chronic METRITIS. It would have been desirable, however, that the author had been more explicit upon the exact form and nature of the disease in which he advises the remedy. All that he states is, that when the swelling, which is one of the characters of this affection, has acquired a certain degree of induration, whether this induration is confined to the neck, or extends to the whole body of the organ,—whether the inflammation has begun by the mucous membrane which covers the neck of the womb, which is the usual case,—or have been developed in the tissue of the organ, we must then look with apprehension upon the progress which this disease may yet make, especially when it takes place in patients in whom certain morbid diatheses may concur to invest it with great severity; in short, may lay the foundation of an incurable organic disorder.

Now what may be the use of this vague mode of speaking, and immediately after adding, that it is easy to understand in such a case the utility of the solvent and resolvent action of the Vichy waters, it is altogether impossible to perceive. To us it appears anything but easy to understand this solvent action. We understand distinctly that in organic disease of the womb, as in organic disease of any other organ, the Vichy waters are not only of no use, but may possibly be hurtful. We do not positively say that they are hurtful. But it must be allowed, that no proof has been given that they are not so. But the question again recurs, what are the forms and degrees of chronic *metritis*, in which these waters are to be used. To this all that M. Petit, so far as can be discovered, answers, you will understand that the essential conditions of their employment are, that the *metritis* is no longer in its acute state, and that there is hitherto no cancerous degeneration. That is, you are to recommend these waters neither in acute *metritis* nor in cancer of the womb. It would have been well if the author, as has been already said, had given more explicit information on this subject.

Next comes the subject of enlargement of the ovaries.

In mere simple enlargements of these bodies, the usual effect of a congestive or inflammatory process, and also when the enlargement has been neither preceded nor accompanied by any perceptible inflammatory action, M. Petit represents the waters of Vichy to be capable of being employed with great advantage.

There are, however, certain enlargements of the ovaries in which he allows that these waters produce no beneficial effect. Such are enlargements which depend on the formation of a fibrous body in their substance; tumours depending on distension and enlargement of the Graafian vesicles so as to form sacs or pouches of various kinds and magnitude; and tumours formed by skirrhous and enkephaloid masses which are occasionally developed within, upon, or around the ovaries.

The great difficulty in practice is to distinguish between the first class of enlargements and the second. The author allows, that when the tumours are large, it is difficult, if not impossible, to draw the distinction accurately; and he allows that it is sometimes difficult to tell, whether in a case of great tumour in the hypogastric region and abdomen, the swelling has originated in the ovary or in any other organ.

It is requisite, nevertheless, to distinguish, and to form a correct diagnosis. The presence of ovarian cysts containing fluid, or what is improperly enough called ovarian dropsy, it is in general not difficult to distinguish. The sense of fluctuation and the history of the case will in general enable a careful observer to form a correct judgment. Much more difficult is it to form an opinion, when the tumour is solid, and no fluctuation is recognized. This, however, is the very case for caution and discrimination.

The author gives one case terminating fatally, and other two terminating favourably after suitable employment of the waters. The only conclusion which appears to be deducible from these facts is, that it is difficult before trial to decide, whether any given case is to derive benefit from the use of the Vichy waters; that it is right to make trial of them cautiously; and if beneficial effects follow and the tumour is reduced, then the inference is that the disorder was chronic inflammation or enlargement of the ovary, without serious change in structure.

Among mesenteric enlargements some yield readily to the use of the waters. Others are stubborn and resist these solvent agents as they resist all other measures. M. Petit states that he has seen various instances of the prompt resolution of mesenteric tumours under the use of these waters; and these tumours he had reason to think were epiploic or omental. If so we doubt whether these ought to be referred to the head of mesenteric enlargements. Probably they ought to be denominated merely abdominal.

Vesical catarrh or catarrh of the bladder is another malady in which these waters are represented to be beneficial and therapeutic. The efficacy of the remedy he allows to depend upon the duration of the disorder and its severity; recent cases being always more easily removed than those of long standing, and mild cases than those of greater severity. In other words, cases, which are curable, are mild; cases, which are not curable, are severe and inveterate. Under all circumstances it appears that the remedy affords relief. The mere warm bath, indeed, is beneficial in this form of vesical disease; and the alkaline warm bath is likely to be still more decidedly so. One season at Vichy is rarely sufficient for cure. Several seasons are usually required.

Here, however, for the present it is necessary to pause. The author is certainly a strenuous advocate for the employment of the waters of Vichy; and we do not say that he is an indiscriminate one. Taken altogether, and attentively studied, his directions are probably as specific and as pointed as the subject admits. At the same time it is not difficult to perceive, that much of the knowledge hitherto acquired on the use of these waters in the treatment of disease is empirical; and that in a large proportion of cases the advice must be tentative.

ART. II.—1. *Observations on Aneurism and its Treatment by Compression.* By O'BRYEN BELLINGHAM, M.D., Edinburgh, Fellow of, and Professor in, the School of the Royal College of Surgeons in Ireland, &c. London, 1847, 12mo, pp. 181.

ART. II.—2. *Practical Remarks on the Treatment of Aneurism by Compression; with Plates of the Instruments hitherto employed in Dublin, and the recent Improvements by Elastic*

Pressure. By JOLLIFFE TUFNELL, M. R. I. A., Fellow of the Royal College of Surgeons in Ireland; Surgeon to the City of Dublin Hospital; Surgeon to the Dublin District Military Prison; and Lecturer on Military Surgery in Dublin. Dublin, 1851, 8vo. pp. 154.

ALL the great operations of surgery have passed through various stages of rudeness, complexity, and inefficiency, and not unfrequently barbarism and cruelty, until they have attained what the surgeons of the day term elegance, simplicity, comparative efficiency, and some degree of mildness and humanity. Nor is the operation for aneurism of the large arteries by any means an exception. Whoever reads the histories recorded by some of our older surgeons of the mode, in which they cut open aneurismal tumours, the violent measures which they employed to arrest the gush of blood from the interior of the sac, the scooping out of clots, and the cramming the interior of it with charpee, sponges, and compresses, the long and tedious suppurations which thence resulted, the sloughing of soft parts, and the exfoliation of bones, the relentless use of hot irons and hot liquids, and the small number of instances in which patients escaped with life, and the not less small number, in which they escaped with limb, will not fail to admit, that, while surgery then required operators strong to inflict and patients stubborn to endure, the operation for aneurism in these times was neither bloodless, nor painless, nor void of danger, and offered at least only an alternative of the mode of extinction. It seemed, indeed, of little moment whether the patient died of the slow but sure approaches of the disease, or the more prompt measures of the surgeon. Such was the practice of PHILAGRIUS; and at a period long subsequent, though with certain modifications, of DE LA VAUGYON, LEGER DE GOUEY, AMBROSE PARE,[*] WISEMAN,[†] DIONIS,[‡] and it may be added, DANIEL TURNER.[§]

Contemporary with PHILAGRIUS was ANTYLLUS, who is represented to have introduced the use of the ligature, or the needle and ligature; but the employment of this measure was attended with neither benefit to the patient nor substantial improvement of the operation. ANTYLLUS did not, like modern surgeons, dis-sect, expose, and isolate the artery, which was to be enclosed and commanded by the ligature. He thrust the needle armed with two ligatures through the skin, deep into the muscles and soft parts of the limb, usually the arm, and, bringing out the needle with the ligature, he tied the whole parts, including the vessel, above and below the tumour, opened the aneurismal sac, cleared out the clots of blood, and filled it with digestive and suppurative applications. These were the days of what is called heroic Surgery.

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[*] The Works of that Famous Chirurgeon, Ambrose Parey, translated out of Latin and compared with the French. By Th. Johnson. London, 1678. Folio, Book VII., chapter xxxii., p. 194.

[†] Several Surgical Treatises. By Richard Wiseman, Sergeant-Surgeon. London, 1676. Small folio, Book I., chapter xvi., pp. 72, 73, 76, &c.; and Book chapter ii., p. 355.

[‡] Cours d'Operations de Chirurgie de montrées au Jardin Royal. Par M. Dionis. 4ieme edition. Par G. De la Faye. A Paris, 1740. 8vo Huitieme Demonstration, p. 688, &c.

[§] The Art of Surgery. In two volumes. By Daniel Turner, M D., of the College of Physicians in London. The sixth edition corrected. London, 1741. Tol. I., section v., p. 547. Treatment by compression, by operation, 548, &c.

Little improvement upon this rude method of procedure was the use of the actual cautery, as recommended and practised by LANFRANC; and after him by MARK GATINARA, DURANDO SCACCHI, and GABRIEL FALLOPIUS, the last of whom further states that he successfully employed caustics, we suppose the potential or chemical, in order to promote suppuration in the sac. MARCUS AURELIUS SEVERINUS is said to have been the first surgeon, who applied a ligature to the crural artery in an aneurismal condition, very near the ligament of Poupart.

Till the sixteenth century, therefore, the treatment of aneurism consisted in inclosing rudely in ligature the ingredient and sometimes the egredient arteries, clearing out the sac, and effecting suppuration and granulation; and in some rare cases in the entire removal of the tumour by incision. Not the smallest of the evils of this mode of operation was, that often it left the patient and his disease in a worse condition than that in which it found both.

Even when the aneurismal tumour was laid open and duly crammed with compresses according to the rules of art, removal of the limb by amputation was a second resource not unfrequent.

Under these circumstances, it is not wonderful that any practicable or probable method of curing the disease in a manner less bloody, less painful, and less tedious, should be received with some favour. JOHN DE VIGO is generally understood to have proposed, about the beginning of the sixteenth century, the use of graduated compression and styptic or astringent applications.* The same method DURANDO SCACCHI wished to employ, at least in the first instance; and both FALLOPIUS and PARE appear to have employed pressure by compress and bandage in various instances of aneurism, but especially in that of the brachial artery when wounded instead of the vein.†

It must not be forgotten, also, that some surgeons at this period laid it down as a rule, that aneurisms of the extremities ought to be treated only by compression, and that no cutting instrument should be employed.

It is probable that this plan was followed by occasional success; for the Abbe BOURDELOT, first physician to the Prince, is represented to have employed on his own arm, towards the middle of the seventeenth century, a sort of tourniquet in the cure of a false aneurism produced in undergoing venesection. This person applied over the tumour a small steel plate covered with cotton and leather, leaving only a sort of groove where the artery was expected to lie, and secured it firmly to the arm. This steel plate he wore for twelve months, and at the end of that time the cure was completed.*

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* Practica Copiosa in Arte Chirurgia Libros Novem Complectens. Edita a Johnne Vigo. Julii 2di Pontificis Maximi Olim Chirurgico. Lugduni Impressa, 1518. Liber IV., Part V., Folio cxxiii.

† The Works of that Famous Chirurgeon, Ambrose Parey, translated out of Latin and compared with the French. By Th. Johnson. London. Folio, 1, 78. Book VII., chapter xxxii., p. 194.

Similar means of compression were employed by various surgeons in the course of this century,—by SCULTETUS, TULPIUS, PETIT, and others; and those most addicted to mechanical contrivances were sufficiently fertile in proposing various pieces of mechanism more or less ingenious, and more or less powerful, which should have the effect of compressing the tumour and the artery, obliterating the latter, and causing the former to disappear.

The practice, nevertheless, was not uniform. LA MOTTE, who practised during the latter years of the seventeenth century and the beginning of the eighteenth, appears to have been partial to the use of the button of blue vitriol placed in the artery, and covered by dressings and compresses; and though it is clear, from his own account, that this practice was not always attended with good results, he evidently reposed in it considerable confidence.† It is singular that some surgeons appear to have assigned as a reason against the use of compression the fact, that it obliterates the artery. They appear to have been unaware, that scarcely can any aneurism be cured without obliteration of the artery, and that obliteration is the most common consequence of all successful methods of treating aneurism.

From the end of the seventeenth to the middle of the eighteenth century, the practice among surgeons may be regarded as represented by PETER DIONIS and his commentator DE LA FAYE in France, and LAURENCE HEISTER and JOHN ZACHARIAS PLATTNER in Germany. These three authorities agree in recommending, in the cure of aneurism of the extremities, compression in the first instance, and if this be not successful, the operation.

Particularly pertinent is the observation of M. De La Faye. When we cannot by compression, he says, cure an aneurism or prevent its progress, we, nevertheless, derive from this method great advantages. By compressing the vessel we prevent the blood from flowing into it in so great amount as ordinary. This obliges part of the blood to dilate gradually the collateral vessels, and disposes them to supply the function of the principal artery, which it proposed to enclose in a ligature. What is here advanced experience confirms. M. Petit has made to me the remark, that the operation for aneurism almost always succeeds, when it is performed after having long subjected the artery to compression.[*]

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* Dionis Cours D'Operations de Chirurgie, 4ieme edition. Par G. De La Faye. Paris, 1740. Huitieme Demonstration, p. 697.

† LA MOTTE Traité Complet de Chirurgie. Par M. Gillaume Manquest de la Motte Chir. Juré. Troisieme Editions Revue, corrigée, et Augmentée de Notes Critiques, pars M. Sabatier. Prof. Roy. A Paris, 1771. 8vo. Deux tomes. Tôme Secunde. Plaies des Extremités. Observ. 270 and 271, p. 182—188.

Heister mentions four different methods of treating aneurismal tumours; *first*, by compression and bandaging, if small, as in the arm; *secondly*, in the instance of large aneurisms, by the operation of cutting into the sac, enclosing the artery in a ligature, and employing afterwards compression within the cyst until it was cicatrized; *thirdly*, the method of Purmann, in placing a ligature upon the artery above and below the tumour without touching the latter; and, *fourthly*, the method of Anel.[†]

John Zaccharias Plattner,[‡] a surgeon who flourished in the beginning of the eighteenth century, devoted great attention to the determination of the order of cases, in which the treatment of aneurism by compression is admissible, and to the improvement of the method of treatment. When the tumour is not of long duration and not very large, when it is situate in the arm or over the course of a bone, and is something circumscribed, he recommends that friction should be employed gently, in order to resolve the coagulated blood. He then applied over the tumour several folds of paper moistened in alcohol, and a graduated series of compresses with a piece of money, metal, or any other hard body between them, and applied over the whole a firm, retentive roller. He further recommends as serviceable, a compressing instrument invented by **Senff**, a surgeon at Berlin, and which consisted of a pad worked by a screw, so as to direct its force upon the tumour. In traumatic aneurism, or that produced by blood-letting or other wound, he recommends the use of a leaden plate, covered by various compresses, and secured by a bandage, the apparatus being moistened with camphorated spirit. Blood-letting he regarded as serviceable in diminishing the afflux of blood to the tumour.

Notwithstanding this preference for the method by compression in certain circumstances, Plattner did not overlook the advantages of the ligature. He was in the habit of applying three ligatures round the aneurismal vessel; two above and one below the tumour, the last of which he believed to be necessary to prevent the influx of blood into the tumour by the collateral arteries. Between these ligatures and the artery he recommended the interposition of a piece of linen, in order to avoid cutting the artery by the threads.

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[*] Dionis Cours d'Operations de Chirurgie, p. 695—note.

[†] D. Laurentii Heisteri Institutiones Chirurgicae. Opus Triginta Annorum. Pars. Prima et Secunda Amstelaedami 1739. Pars Altera, &c. Sectio ii., cap. xiii., p. 440, &c.

[‡] Jo. Zachariae Plattneri, D. et Prof. Med. Lips. Institutiones Chirurgiae Rationalis Tum Medicae Tum Manualis in usus Discentium. Editio Altera Lipsiae, 1758, 12mo, pp. 944. Date of preface, Leipsic, 23d May 1745, § 431.—§ 443.

In these days the exact operation of the ligature was not understood.

Compression, nevertheless, had its advocates. GENGA, a Roman surgeon, in the beginning of the eighteenth century, had been led to use a similar plan in treating both wounds and aneurisms of the brachial artery, which this surgeon was occasionally in the habit of opening, for the cure of certain severe attacks of headach. The method of GENGA was to apply a firm compress over the tumour or wound, and secure it by means of a firm uniform bandage, which was continued from the fingers the whole way up the arm. CARLO GUATTANI, the celebrated surgeon of Genoa, recommended the method strongly, and practised it with great success in the treatment of false aneurisms; applying over the tumour thick compresses, and retaining them by firm bandages. The true aneurism he continued to treat by ligature, especially when of long standing and considerable size.

THEDEN, a military surgeon of Prussia, of great celebrity in his day, contributed to render the practice of treatment by compression, serviceable if not popular. He was in the habit of applying over the tumour a plate of lead, and maintaining it in its position by a circular bandage or strap, while in order to prevent oedema and the irksomeness of partial local pressure, he enveloped the whole limb from its extremities upwards in broad long bandages carefully applied. This method by general compression, however, was still found occasionally inadequate to effect a cure, it was said, chiefly in aneurisms of long standing; and hence the operation in one shape or other was still frequently employed by surgeons.

One great objection to the operation appears, from the testimony of various surgeons at that time, to have been the circumstance, that either by inattention the nerve was included in the ligature of the artery, or it was accidentally inclosed in the ligature; and to this ligature of the nerve various evils, and especially the final failure of the operation were ascribed. On this account, while John Macgill recommended the ligature as the most certain and efficacious method of curing aneurismal tumours, he particularly impressed the necessity of dissecting the artery and avoiding the ligature of the nerve; while Donald Monro, in order to insure the isolation of the artery, proposed to carry a probe into its interior, and thus raise it before tightening the ligature. Sharp, on the other hand, appears to have entertained less apprehension of enclosing the nerve in the ligature, than of lacerating or cutting the artery by its means.*

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* A Treatise on the Operations of Surgery, &c. By Samuel Sharp, Surgeon

It is remarkable, that in these days, no dread appears to have been entertained of the effects of enclosing in the ligature the vein or any of its branches. It is next to certain, nevertheless, from the facts which modern experience, aided by dissection, have brought to light, that great mischief often resulted from ligature or other injuries of veins, that these vessels were often attacked by inflammation after the operation, and that this venous inflammation must in many instances have proved one cause quite sufficient, without others, to bring about the fatal termination of the case. Tying both nerve and vein, and at least injuring much the latter, were almost unavoidable in any form of the old operation for aneurism; and when we consider the uncertain ideas that prevailed on the action of the ligature and the mode of its application, as well as the other modes of treating the sac, that failures were numerous and mortality considerable, are circumstances not in any way extraordinary.

At length John Hunter, by that superior power which distinguishes genius, devised a method of treatment which possessed the merit certainly of being greatly more simple, infinitely less painful, scarcely bloody, in no comparison so tedious as that formerly in use, and which, by avoiding many avoidable causes of mischief, not only gave patients a much better chance of recovery, but did not so completely deprive them of those, which the presence of the aneurismal tumour had left. It was one great advantage of the method introduced by John Hunter, that, by placing the ligature upon the artery above the aneurismal tumour, and as remote from that tumour as the case allowed, he not only avoided touching parts greatly diseased in structure and deranged in relative position, but, by taking advantage of the restorative powers of the organic textures and the system at large, it gave an opportunity for the tumour being cured by the ordinary operation of those powers which are at all times at work in the living body.

The method proposed by John Hunter in 1785 was in general rather successful in this country in the hands of Sir Everard Home, Mr Abernethy, Sir Astley Cooper, Mr Lawrence, and Sir Benjamin Brodie. Abroad it seems to have failed in the hands of such eminent surgeons as Vacca, Fflajani, and others; a circumstance which probably is to be ascribed, in some degree, to the use of pieces of linen, tape, and broad ligatures, under the idea that the narrow thread cuts the artery, and thereby causes hemorrhage. Inflammation and sloughing of the arterial coats and consequent hemorrhage were the frequent and almost certain consequences of the application of the slips of linen, the tapes and similar

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to Guy's Hospital. The Tenth Edition, with several alterations, London, 1751. 8vo. Chapter xxxvi. and xvxvii., p. 205.

A Critical Enquiry into the Present State of Surgery. By Samuel Sharp, F.R.I., and Surgeon to Guy's Hospital, the Third Edition. London, 1754, 8vo, Chapter Eighth, p. 298o—313, 311—313, for his facts and arguments as to harmlessness of tying the nerve.

appliances, whether as safety ligatures (*ligatures d'attente*) or not.

It must not be denied, nevertheless, that in many instances of aneurism of different arteries of the extremities, though the operation was undertaken under circumstances considered favourable, and was accomplished with ability and dexterity, and with every precaution to insure a favourable issue, the result has been otherwise. The only mode in which the merits of any given operation can be determined has been adopted; namely, a careful statistical survey of all the recorded instances of operation and their results; and the result of this numerical examination has been to show, that the operation performed under all the most favourable conditions, and with due attention to all rules is, nevertheless, attended with an amount of mortality, which is considered as large.

The sources of information on this topic are three.—One is the work of Dr Crisp on diseases of the blood-vessels. In this treatise are given the particulars of one hundred and eighty-eight cases in which the artery was secured for popliteal or femoral aneurism.

Of these		188
Died from the effects of the operation,	35	
Recovered after undergoing subsequent amputation,	11	
Recovered after sloughing of the sac,	2	
Recovered after mortification of the toes,	1	
Recovered after sloughing of the integuments,	1	
		— 50
		138

So that more than one-fourth of these 188 cases either terminated fatally or were maimed for the rest of life; while one hundred and thirty-eight cases recovered.

Secondly, Mr Phillips collected one hundred and seventy-one cases of aneurism affecting the arteries of the lower extremities in which the Hunterian operation was performed. Of these cases fifty-seven, or, exactly, one in three, were unsuccessful, in which all the patients, except two, died, not of the disease but of the operation. Among the successful cases (114) secondary hemorrhage took place fifteen times. In fifty-nine of these cases the femoral artery was enclosed in a ligature; and in thirty-nine of these the results were unfavourable; thus giving a mortality of two in three in the artery most frequently subjected to operation.

The fullest and most elaborate, and perhaps the most accurate report is that given by Dr George W. Norris in the American Journal of Medical Sciences for October 1849, and an abstract of which was published* in the seventy-third volume of this Journal. Dr Norris remarks at the commencement of this tabular view that the numbers presented, place in a striking light, the dangers attendant upon the Hunterian method of operation for what appears to the most common form of external aneurism; and, inasmuch as it is the form of aneurism to which the treatment by compression is more particularly adapted, he subjoins a tabular statement of the cases treated by the latter method, taken from the essay of Dr Bellingham, and such others as had come to his knowledge since the appearance of his performance.

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* Edinburgh Med. and Surg. Journal, vol. seventy-third. April 1850, p. 492.

The table of Dr Norris contains two hundred and four cases, in which the femoral artery was enclosed in a ligature according to the Hunterian method. Of these there recovered one hundred and fifty-four; and fifty died. Ten of the patients who recovered had to undergo amputation in consequence of the approach of gangrene of the limbs. Of these 204 cases, one hundred and seventy-seven were instances of aneurism, 155 of Popliteal Aneurism, and 22 of femoral aneurism, in which the operation was performed. The general distribution of results is the following:—

Number of cases,		177
Died from the effects of the operation,	38	
Recovered after subsequent amputation,	6	
Recovered after suppuration of the sac,	10	
Recovered after gangrene of the foot,	2	
	56	

One out of every three cases, therefore, operated upon, either terminated fatally, or were to a certain extent deprived of the use of the limb for the remainder of their lives.

These instances took place in the practice of the most eminent and experienced surgeons; Hunter, Cline, Deschamps, Pelletan, Home, Cooper, Travers, Lawrence, Brodie, and others too numerous to recount.

The inference from all these facts Dr Norris thinks is, that the method of curing aneurism of the lower extremities by enclosing in a ligature the sound part of the artery above the tumour is not attended with the advantages which it was expected to afford. Sound surgery, according to Dr Norris, condemns this method of treatment.

To demonstrate the superior advantages which this method of compression presents, Dr Norris gives a table of all the recorded cases, in which this method has been adopted since the year 1842, partly derived from the tract on aneurism by Dr Bellingham, partly from the report on surgery contained in the first volume of the Transactions of the American Medical Association. From this table it results that compression has been tried in thirty cases of popliteal aneurism, and seven cases of femoral aneurism, in all thirty-seven cases; that of these thirty-seven cases only one person died suddenly from disease of the heart forty-eight hours after pressure had been withdrawn; and in one case the compression failed to accomplish the purpose, and the operation was performed. There are therefore thirty-five recoveries in thirty-seven cases, or only one death in thirty-seven cases, and one instance in which the compressive method was found inadequate. In one case, the 24th, by Dr Bellingham, pulsation continued in the sac for some time after compression had been applied. A galvanic current was transmitted through it. Seven days after this, the patient was attacked by rose and died after the lapse of six days.

For this method of operation, accordingly, Dr Norris is a strenuous advocate, next after Dr Bellingham; and Mr Tufnell follows both in recommending this method of treating aneurismal tumours as infinitely superior to that by ligature. As the evils for which Mr Tufnell proposes a remedy are of a serious description, and as the remedy has been shown to be at once practicable and adequate, it is right that we should allow the advocates of the method to have a fair hearing with the profession.

From what has been already stated of the history of the operation for the treatment of aneurism, it is clear that the method by compression is not new. It was at one time indeed practised probably much more frequently than the method by ligature. At all events, both from what is taught by Heister and Plattner, two considerable surgical authorities in the first half of the eighteenth century, it is clear that it was very frequently attempted. It appears to have fallen so completely into desuetude as to be much overlooked, only after the introduction of the Hunterian method, and the great names by which that operation was sanctioned and supported. It naturally comes to be an object of inquiry, how, if it possess any merits whatever, it should have been so long in oblivion and abeyance; and by what means, and under what conditions, it is now revived and placed before the profession, with claims of no moderate urgency to be re-instated in surgical favour.

It was neither in London nor Edinburgh, Manchester nor Liverpool, Paris, nor Vienna, nor Berlin, nor at Rome, nor Florence, nor Bologne,—Madrid need not be mentioned,—that the compressive treatment of aneurismal arteries was raised from the tomb to which, in all appearance, it had been consigned. It was in the city of Dublin.

It had been long observed by surgeons that in certain cases of aneurism otherwise favourable for operation, when the operation was performed, gangrene came on, the sac inflamed, suppurated, and sloughed, or some other great catastrophe disappointed the expectations of the operator. It was inferred that this and similar results were occasioned by arresting more rapidly than the collateral circulation could admit, the current of blood through the main channel of the limb. The inference was not unnatural, though we do not think that it was founded on all the circumstances of the case. Right or wrong, however, well founded or not, such was the inference; and, acting upon it, it was believed that if compression by means of a tourniquet or any other manageable instrument, were gradually and gently carried on, the force and amount of the blood sent through the main artery would be so much diminished, while the quantity sent through the small collateral and anastomosing branches would be so gradually yet considerably increased, that for the nutrition of the limb ample provision would be made, and the deligation of the artery, when it came to be performed, would be effected without disturbing materially the circulation of the limb.

Upon this principle chiefly Mr Todd, of the Richmond Hospital attempted compression in a case of aneurism, in the year 1820. The idea of Mr Todd is represented to have been that "by compressing the principal artery for a few hours every day, mortification of the limb might be prevented by allowing some progress to be made in establishing the collateral circulation,"—"at the same time that he was not altogether without hope, that, by diminishing the current of blood in the trunk of the artery, so as to favour the coagulation of the contents of the sac, a cure without operation might be effected." In this expectation, however, Mr Todd was disappointed. The operation was required and performed.

The next trial of this method was in 1824, and it was more successful.

A tidewaiter of intemperate habits, who was in 1818 labouring under popliteal aneurism, made a violent exertion, during which the aneurism burst and became diffused. More than one week afterwards, this person applied for relief to Dr Duggan, surgeon to the revenue police of Dublin, who at once informed the patient that amputation was indispensable; and he accordingly removed the limb above the knee.

Six years after this event, namely, in May 1824, the tidewaiter observed in the course of the femoral artery of the stump, one inch and a-half below the ligament of Poupart, a pulsating tumour, which gradually increased in size, and in the following August had attained the magnitude of a Turkey's egg. Dr Duggan, whom the patient again consulted, deemed the operation not advisable, and determined to try the instrument of Mr Todd for compressing the artery in the groin. The instrument was applied on the 27th of August; and on the 20th of October all pulsation had ceased in the tumour. It is not said whether the tumour was much or in any degree diminished. But it is stated that the patient subsequently survived upwards of twenty years.

The following year, namely, in 1825, Mr Todd treated with success an aneurism of the femoral artery by applying steady and forcible pressure over the artery by means of the same instrument.

The instrument or apparatus resembles a common femoral truss or spring bandage, with a stronger spring than that of the hernia truss, the pad longer, of a more oval shape, and more firmly stuffed. The pad of this instrument is furnished with, or rather supported and corroborated by an internal plate of iron, which is connected with the outer iron plate, by means of a hinge close to the junction of the outer plate with the spring; while, by means of a tourniquet screw passing through the plate, the attendant has it in his power to make a greater or less degree of pressure by the pad on the part to which it is applied. This instrument was fitted on the limb like a common rupture truss, with the pad applied over the course of the crural artery immediately below Poupart's ligament; and it was effectually retained in its position by means of a strap of soft chamois leather, which passed from the spring of the truss behind on the inside of the thigh, and was buttoned in front, on the outer plate of the pad. A figure of the instrument is given.

Mr Tufnell is unwilling to admit, that this case, however successful were its termination, and however close might be the connection between the use of the instrument and the result obtained, laid the foundation for compression as an ordinary and established mode of cure. The reason which he assigns for declining to admit this inference, is curious. Mr Todd, he says, soon afterwards died. The case was not published; and the fact of its occurrence within the Richmond Hospital made no impression on his colleagues. The treatment never was introduced. To speak to the exact fact, the example set was not followed.

Seventeen years elapsed, during which the ligature was invariably employed in the Richmond Hospital until October 1842; and on that occasion also it would have been the means adopted; but the patient declined to submit himself to the preliminary incisions. Under these circumstances, Dr Hutton, under whose care this patient was, from reading and knowledge of plans, which, from time to time had been proposed or put in use, resolved to attempt the cure of the aneurism by means of compression. This intention Dr Hutton announced to his colleagues, who approved of the proposal, while Mr Adams mentioned the favourable termination which Mr Todd had obtained in 1825 from the method.

It is stated that, up to this time, the result of Mr Todd's case was unknown to Dr Hutton, and indeed to all but Mr Adams, or it had made upon them no impression; and accordingly, Mr Tufnell represents the proposition as perfectly newly devised by Dr Hutton. It is not easy to conjecture what may have been the reasons for this total forgetfulness of the result of Mr Todd's case. It might be, that one case was not thought sufficient to justify a considerable innovation, in what was at that time regarded as an established practice. It seems, nevertheless, neither reasonable nor just to say, that because Mr Todd's experimental case was neglected and forgotten by his colleagues, he had no merit in proving the practicability of the principle which that case implied. That the facts of the case were unknown was not the fault of Mr Todd, who had shown these facts in a public hospital. It showed only a large amount of indifference, and perhaps some degree of obstinacy, on the part of those by whom the experiment was witnessed. We can see no reason, therefore, for admitting the conclusion of Mr Tufnell, that from the case of Dr Hutton must be dated the origin of the present treatment of aneurism by compression, and that this case must be regarded as the foundation of the method. For the facts given by Mr Tufnell himself, if we are not to go back to the times of Dionis, Heister, Plattner, and Guattani, for the first trials of the practice, certainly Mr Todd is entitled to what ever merit belongs to the revival of the method, since the commencement of the nineteenth century.

It must, nevertheless, be allowed, that a considerable degree of merit belongs to Dr Hutton for the second revival of this method of treatment; for it appears that in consequence of the successful result of the case in which he tried the compressive method in November 1842, other surgeons were induced to subject the method to trial in similar cases.

The instrument or apparatus employed by Dr Hutton is very similar in principle and operation to all the other means, that have been devised with similar intentions. A circular iron hoop one inch and a quarter broad and seven inches in diameter has fitted to one side a screw terminating in a pad. To this pad, and at right angles to the hoop, is attached a small slip of wood one inch broad and nearly five inches long, on the upper end of which is fixed sufficient chamois leather to make a pad, a deep notch being cut on each side of the wood at the other end. When the iron hoop was placed on the thigh as close to the pubis as was possible, the wooden slip pointing upwards, the pad attached to the iron screw was forced down on the vessel. A cord previously tied round the notch in the lower end of the piece of wood fastened it to the pad; and thus secured, it pressed directly on the vessel, while the padded end of the piece of wood took the artery as it passed over the pubis. This apparatus was applied in a case of popliteal aneurism in a man of thirty years on the 3d of October 1842, and was kept applied for twenty-eight days with the effect of curing completely the aneurismal swelling.

In January 1843 Mr Cusack adopted the same method with a patient in Steven's Hospital, employing an instrument which Sir Philip Crampton had contrived and employed successfully for compressing the femoral artery at the *os pubis* in a case of secondary hemorrhage, where the ligature had been applied in Scarpa's space. The principle of this instrument, though differing a little in details, is quite the same as the others. It is sufficient to say, that after its application for the space of thirty-one days, the tumour ceased to show any pulsation and was cured.

The next case occurred in March 1843 to Dr Bellingham, who, by means of a similar apparatus, effected in less than forty-eight hours consolidation of a large aneurism in the popliteal space, measuring three inches in transverse and more in the long diameter. This case is regarded as the great triumph of the compressive method of treating aneurism, and not only induced Dr Bellingham to espouse very strenuously and perseveringly the cause of compression, but has manifestly led all the Dublin surgeons to speak of the efficiency of the method, in those confident terms, which have contributed to furnish so great a number of illustrative and corroborative cases.

The method of maintaining the compression was nevertheless not free from objection. It appears to have been in all cases irksome, and in some it seems to have caused so much pain that the apparatus required to be removed for a time. This was ascribed to the firm and unyielding sort of pressure effected by the screw. By introducing bands of vulcanized India-rubber and compresses of the same, a method devised by Dr Carte, this objection has been either removed or very much diminished. We are to understand, in short, that the new instrument or apparatus as completed according to the suggestions of Dr Carte, is the standard of perfection for compressing an artery in attempting the obliterating of an aneurismal tumour or the adhesion of the arterial walls for any other purpose. This apparatus is in surgery what the lines of Villars from Bouchain to Arras, or those of Torres Vedras were in the military art.

It is necessary further to mention that, besides the mere artery compressing apparatus, there is another auxiliary or vicarious method strongly recommended, first by Dr Bellingham and again by Mr Tufnell. This consists in the use of a weight of a conical shape, averaging from six or seven to ten pounds, with a small oval pad attached to its small end. The weight is to be placed upon the artery in the groin, and there retained by the patient's hand. The use of this, however, is admissible only at one spot of the artery, that, namely, where the vessel crosses the *os pubis*, and where a bony point for counter-pressure can be rendered available in the same manner. Though the means be simple, Mr Tuffnell looks upon it as important and efficacious.

Our limits permit us not to enter into the descriptive details of either the improved apparatus of Dr Carte, or the multiplied. contrivances by which it is sought to attain the same object. Of all the principle and end are the same; namely, to compress more or less forcibly the femoral artery in the groin, and thereby to diminish and cut off the flow of blood through the femoral artery, to produce obliteration of its channel, adhesion of its walls, and the consequent shrinking and obliteration of the walls of the aneurismal sac. Mr Tufnell speaks in terms of high commendation of the apparatus of Dr Carte; and we doubt not that the terms are merited; and he is not less decided in representing all the other apparatus as altogether useless, inefficient, and already obsolete, and antiquated. "The others," he says, "are all obsolete; they have had their day, and gone, giving way to the improvements made in those I name—alterations calculated to obviate deficiencies existing before."—P. 56.

The other contrivances here referred to are partly those already mentioned, partly six other forms of apparatus; namely, Read's Pelvic saddle for compressing the artery at the groin,—the ring Tourniquet, and the Clamp,—L'Estrange's Tourniquet,—Millikin's double-padded Compressor,—and the double-actioned Compressor. Of these the author gives figures; and he allows that the forms of the instruments may prove useful in the adoption of such modifications and alterations, as may be requisite to suit particular cases. But he expresses confidently the opinion that he considers none as calculated for the treatment of aneurism by compression, that are worked solely on the principle of the screw.

Very much inclined would we be to assent to all this exclusive commendation of one apparatus, had we not lived to see the most excellent and suitable apparatus for various purposes in surgery completely thrown aside, after the lapse of some years; and seen preserved in museums and other collections of curiosities, or thrown into the lumber rooms of hospitals, as no longer useful, mechanical contrivances upon which, in their day, the same judicious commendations had been pronounced. Even for the very purpose of compression, there are delineated and described in some of the not very recent systems of surgery—for instance, Dionis, Heister, and Plattner,—pieces of mechanical apparatus which we are assured by respectable and credible authorities, admirably answered the purposes intended; and which, notwithstanding, are now altogether unknown except to antiquarians in surgery and collectors of surgical curiosities. To the observer of modes in surgical apparatus, it will be a matter of interest to notice and record what has become of all these contrivances, not excluding that of Dr Carte, in the years 1861 and 1871.

Such in plain and unadorned language,—avoiding the magnificent expressions of the eloquent Mr Tuffnell,—is the history of the introduction or rather revival of the method of treating aneurism by means of compression.

On the question as to the effects of compression, the knowledge of which furnishes the only method of determining when it ought to be employed, or whether it ought to be employed at all, Dr Bellingham has made some instructive observations.

This author first establishes from various facts the following aphorisms.

1st, That nature herself sets up a process by which, under favourable circumstances, the cure of aneurism is effected.

2d, That the mode in which this is effected always in internal aneurism, and frequently in external aneurism, is by the deposition of the fibrine from the blood in the sac of the aneurism, until it becomes filled.

3d, That the fibrin in such cases is deposited in regular concentric laminae, the oldest or first formed next the sac, those most recently formed nearest the centre.

4th, That a current of blood through the aneurismal sac is a necessary agent in bringing about this result.

5th, That any obstruction to the current by which its velocity and amount are diminished, will accelerate the deposition of fibrin in the aneurismal sac.

6th, That when once this process has been commenced, if the same agents continue in operation, it will go on until the sac becomes filled, and no longer permits the entrance of blood.

Dr Bellingham is further anxious to correct several erroneous but generally received notions on compression, and its effects. Though surgical writers have generally appeared to think, that in order to effect the cure of an aneurism by compression above the tumour, it was necessary to interrupt completely the current of blood through the vessel, in short, to apply pressure which would act in a manner equivalent to the ligature, induce inflammation in the arterial coats, and obliterate the circulation in the vessel at the point to which the compression was applied, Dr Bellingham infers, that it is not at all essential that the circulation through the vessel leading to the aneurism be completely checked, but rather the contrary. He allows that this degree of compression may be advantageous at first for a short period, as by that means the collateral circulation will be more certainly established. The result of one case, which was communicated by Dr Bellingham to the Surgical Society of Ireland, at a meeting held on the 22d April 1843, establishes, he infers, the fact, that a partial current through an aneurismal sac will lead to the deposition of fibrine from its interior, and cause it, within a few hours, to be so filled and obstructed as no longer to permit the passage of blood through the sac.

Dr Bellingham, in short, draws two inferences which may be regarded as the foundation of the whole theory. The first is, that it is not by the formation of a coagulum in the aneurismal sac that nature effects the cure of the disease, but by the deposition of fibrine from the blood, which circulates through the sac. The second inference is, that simply diminishing the current will not cause the coagulation of the contents of an aneurism, but it will occasion the deposition of fibrine in the sac.

There is a strong temptation in this case to ask what is the difference between causing the coagulation of the contents of an aneurismal sac and the deposition of fibrine within the sac? Is fibrine deposited without coagulation; is not the deposition of fibrine a species of coagulation? If coagulation take place, is fibrine not deposited? We must admit our inability to perceive the distinction here attempted to be made. If the contents of an aneurism are coagulated, we think that the deposition of fibrine has either already taken place, or must speedily follow. All this, nevertheless, we submit in deference to Dr Bellingham, who probably has some mode of showing the difference between the two processes. Let it be remembered, that we have read what he states at p. 137.

It is right nevertheless to allow Dr Bellingham to state his facts in his own way:—

"When the sac of an external aneurism has become filled by fibrine, the disease is evidently also cured, and the circulation through the artery may continue for a time; but the anastomising branches here being numerous and free, the blood passes down the main artery of the limb in a dimished stream, the deposition of fibrine therefore continues until the artery at the seat of the aneurism is encroached upon and gradually filled by fibrine, when its pulsation stops, and the deposition of fibrine ceases.

"Once a certain amount of fibrine has been deposited in an aneurismal sac, as the result of pressure upon the artery above, there would appear to be an irresistable tendency to its continuing to be deposited until the artery at the part is likewise closed up; this fact has been proved by the two cases to which I have recently referred, where the patients refused to continue the pressure, and commenced taking exercise; yet under these apparently unfavourable circumstances, the pulsation ceased after a short interval, and the cure was effected. It is therefore not unlikely that the artery has many times been tied in aneurism, where the process which nature sets up for its cure had made considerable progress, and where a little further delay would probably have done away with the necessity for its performance.

"The ultimate changes which takes place when the pulsation of an external aneurism ceases, are the same, whether this result has occurred spontaneously or been brought about by compression. The circulation is carried on by the enlarged collateral vessels, the contents of the sac and of the artery at the part from which it springs, are gradually removed by the absorbents, the sac disappears in a great measure, and the vessel is eventually converted into an impervious ligamentous band. Guattani, Petit, besides many other writers, have reported cases of aneurism spontaneously cured, where this condition of the parts was found; and I have already described the appearances which I found in a case where the patient died two years and a-half after the cure of a popliteal aneurism by compression, and sixteen months after the cure of a femoral aneurism in the opposite limb; 'the artery at the site of each aneurismal sack was converted into solid, thick, ligamentous band, its channel was obliterated, and the contents of the sacs had been removed by the absorbents.

"The foregoing facts all go to prove, that when a cure of external aneurism takes place spontaneously, or when it is brought about by compression, it cannot fail of being permanent; the sac is filled up, and the artery from which it springs is obliterated; consequently, pulsation cannot return, nor can a secondary aneurism form at the part, both of which have occasionally occurred after an apparent cure by the ligature."—Pp. 141, 142.

Dr Bellingham subsequently enters into a lengthened disquisition to demonstrate the advantages of the treatment by compression over that by ligature, and to answer all reasonable objections. As our space will not permit us to follow him over this lengthened course, it may be well to subjoin the following aphorisms as containing a summary of the doctrine which he advocates.

"1. The arteries to which compression is applicable being far more frequently the subject of aneurism than those to which it is inapplicable, compression is calculated to supersede the ligature in the great majority of cases.

"2. The cure of aneurism by compression upon the artery between the aneurismal sac and the heart, according to the rules laid down here, is accomplished by the gradual deposition of the fibrine of the blood in the sac, until both the latter and the artery at the part are completely filled. The process is in fact exactly similar to that by which nature effects a spontaneous cure of aneurism.

"3. Such an amount of pressure as would cause inflammation and adhesion between the opposite sides of the artery at the point compressed is never required.

"4. The pressure should not be so great as to interrupt the circulation in the artery at the point compressed; an essential agent in the cure being that a current of blood should pass through the sac.

"5. Compression by means of two or more instruments, one of which is alternately relaxed, is much more effectual than by any single instrument, and in many intances the pressure can be maintained by the patient himself.

"6. The treatment of aneurism by compression does not involve the slightest risk to the patient, and if persevered in cannot fail of effecting a cure.

"7. A cure of aneurism effected by compression, according to the laws laid down here, must necessarily be permanent; and in every case in which a cure has been accomplished, the patients have remained well subsequently.

"8. The femoral artery remains pervious after the cure at the point at which the pressure had been applied, and no morbid change of any kind is to be detected in either the artery or vein at the site of the compression.

"9. When a cure is effected by compression, the vessel is obliterated only at the seat of the aneurism, and the artery at this part is eventually converted into an impervious ligamentous band.

"10. Compression effects the cure of aneurism by more simple and safer means than the ligature, while it is applicable to a number of cases in which the operation is contra-indicated or inadmissible.

"11. Compression is not necessarily a more tedious or more painful method of treating aneurism than the ligature, while it is much more certain, more likely to be permanent, and is free from all danger.

"12. Compression, according to the rules laid down here, has little analogy with the old method which went by this name; and in fact has no greater resemblance to it than the Hunterian operation had to the operation for aneurism which it superseded."—Pp. 180, 181.

Mr Tuffnell is at some pains to impress the necessity of accurate diagnosis of the exact nature of the case before measures for compression be adopted; he mentions the possibility of mistaking rheumatic stiffness and pain for that of aneurism, and the converse; and he quotes one instance in which an enlarged bursa assumed the appearance of popliteal aneurism. He gives the usually received diagnostic marks; none of which can be regarded as characteristic except the stethoscopic murmur; but his exhortations are certainly by no means useless or unnecessary. The following observations are entitled to much attention.

"They are, however, not the only kinds of pain that accompany aneurism in the popliteal space. There is another of a more lasting and boring description. Like the former, (sharp flying pains seeming to encircle the patella,) it occurs mostly at night; but instead of being sharp and flying, it is persistent to a degree often inducing the patient to keep the limb considerably bent. This is an ill omen. It betokens a condition, which, unchecked, leads on to softening and erosion of the posterior facets of the condyles of the femur and cartilage. On the corresponding portion of the tibia, with irritation of the synovial membrane from pressure against the posterior aspect of the joint. It tells us that the aneurism springs from the arterior aspect of the artery, or that nearest to the bone,—a position which, in its subsequent enlargement materially effects the progress of the disease, by inducing it to press against and open into the joint. Such has been the state of things found to exist in cases where the amount of constitutional disturbance rendered either ligature or compression undesirable, and pointed to the necessity for the removal of the limb."—P. 39-40.

To this persistent pain, then, Mr Tuffnell directs particular attention, because he is of opinion that it may tend materially to assist in forming a diagnosis, and prevent the surgeon from offering too favourable an opinion as to the result of the case. Aneurism, in short, when arising from the articular or anterior aspect of the popliteal artery is a more formidable malady, than when it springs from the posterior or lateral portion of the vessel, and requires to be checked in its progress with the least possible delay.

The cure, he also thinks, is less speedy in the case of fusiform than in that of the globular-shaped sac.

Aneurism of one of the external arteries, or those of the extremities, is occasionally associated with aneurism of some internal artery; the arch of the aorta, the *innominata*, the descending aorta. In cases in which there is any reason to believe in the existence of this complication, Mr Tuffnell pronounces the treatment by ligature altogether inadmissible, as likely to be most hurtful, and the method by compression as alone calculated to effect a cure, (p. 44.)

Compression he further considers to be applicable in every case of ordinary circumscribed aneurism, in an extremity where there is sufficient room for the application of the compressing agent at two different points above the tumour, providing the pressure on the trunk of the vessel completely controls pulsation in the sac, thus proving that no high bifurcation exists.

Conversely, Mr Tuffnell does not advise it in cases, in which the aneurismal tumour is rapidly enlarging in size, or where it continues to do so after compression has been attempted. Aneurisms of this kind have no distinct sac; and to afford any chance of saving the limb, the blood, through the main channel, must at once be cut off by enclosing the vessel in a ligature. Neither does he think it advisable in cases, in which the disease has been allowed to advance unchecked, where the limb has become œdematous and swelled, and the surface of the tumour has assumed a dusky yellowish red colour. In such circumstances he thinks that most probably the vein is involved in the disease; and if it be popliteal aneurism, the knee-joint is inflamed. Under such circumstances, amputation he regards as the only resource.

It is further necessary, Mr Tuffnell observes, to consider the state of the system in which aneurism may occur. Though, generally speaking, it is a malady taking place in persons of muscular development, and apparently healthy frames, yet occasionally it manifests its presence in persons of nervous habit and anaemic disposition. In cases of the former order, or the hyperemic, it is important to quiet the circulation by rest, restricted diet, the occasional use of saline purgatives, and compound jalap powder, with cream of tartar solution for drink, and, if need be, bloodletting, and the use of foxglove. For the two latter remedies, however, he thinks that occasion is seldom requisite. In the nervous and anaemic state, on the other hand, chalybeates must be administered, and the strength cautiously supported.

When the instrument or apparatus has been applied and kept retained over the trunk of the affected vessel for some time, several days, twenty days, twenty-five days, or even longer, the first important change that takes place is, that the outline of the sac becomes more distinctly defined and circumscribed. When pressure is relaxed, the tumour pulsates less strongly than formerly, and the patient may be sensible that he cannot feel the sac distended by the influx of blood as plainly and as painfully as it was at first. The whizzing murmur becomes much softer and emits a less roughened sound.

When these changes are taking place, great care is necessary, as a few hours are often sufficient to produce consolidation of the whole contents of the sac. The case should therefore be watched; and if the circulation through the aneurism have not been previously completely controlled, it should now be stopped altogether. This is soon succeeded by flying pains in the tumour, which shoot from it down the outside of the leg, and run over the toes and foot. These are represented to be often preceded by nausea and a sensation of debility throughout the whole frame, in short, a certain amount of symptomatic fever. After this, in a certain number of cases, follows a burning pain within the tumour and throughout the limb, often waking the patient if he happen to be asleep. Occasionally, on the other hand, in rapid cases, as well as those of more gradual course, the pulsation finally ceases, and no such occurrence takes place.

Mr Tufnell enters into some details regarding certain peculiarities taking place in particular cases. For these, however, the reader will do well to consult the work itself.

According to the method of treatment thus strenuously recommended by Dr Bellingham and Mr Tufnell, thirty-nine instances of popliteal, femoral, brachial, and radial aneurism have been treated, all in Dublin, either in public institutions or private houses, during the space of eight years, extending from October 3d 1842 to February 1851. The following are the results:—

In thirty of these cases the cure has been perfect and complete.

In one case (20) compression was discontinued, the aneurism not subsequently increasing in size.

In two cases (10 and 25) the ligature was resorted to, and the artery was tied with success.

In three cases (26, 38) amputation became necessary, each instance being followed by recovery.

In one case, death ensued from erysipelas.

In two instances death took place in consequence of co-existing disease of the heart.

The forms of aneurism, in reference to situation, were twenty-eight instances of the popliteal artery, seven of the femoral, three of the brachial, and one of the radial artery.

Of the whole thirty patients twenty-eight were males, only two were females. In one of the females the disease was traumatic aneurism of the brachial artery caused by gunshot.

Of the male patients, one was eleven years, another fifty-five, another forty-eight. All the others, in number thirty-four, were from twenty-five years of age to forty-four inclusive; but at least twenty-eight were below thirty-five years.

Regarding the time during which pressure was applied, the shortest case of all is one by Dr Hutton, in which the cure was effected by compression for seven hours; and one by Dr Humfrey, in which it was effected after ten hours. Next comes one by Sir Philip Crampton, sixteen hours; one by Dr Bellingham, twenty-three hours; one by Dr Humfrey, thirty-three hours; and one by Dr Clayton, thirty-nine hours.

Next come the cases in which the time is computed by days. First comes that by Dr Bellingham, already mentioned as only two days, and a case by Dr Macdonnel, in the Richmond Hospital, also two days. One case by Mr Cusack, is four days; one by Dr Bannerman, five days; one by Mr Tufnell, six days; one by Mr Cusack, seven days; one by Mr Cusack, nine days; one by Dr O'Ferrull, eleven days; one by Dr Hutton, twelve days; and one by Mr Tuffnell, thirteen days.

After this the cases rise to twenty days, of which there are three examples; twenty-one days, two instances; twenty four days; twenty-eight days; thirty-one days; thirty-three days; thirty-seven days, forty-two, and forty three days, fifty-three days, seventy days, seventy-two days, and ninety-three days.

From these numbers not much serviceable information can be elicited. All that they show is, that, though in certain favourable cases pressure over an aneurismal artery for seven, ten, or sixteen hours may be followed by obliteration of the channel of the artery and contraction of the aneurismal sac, yet this can be rarely expected in a shorter space of time than twenty days, and in certain cases it will occupy twice or three times that period. The average of the whole is in round numbers twenty-five days.

We do not think, nevertheless, that with all these allowances and deviations the treatment can be called wearisome and prolonged. The average time for the treatment of the cases, Mr Tuffnell calculates at twenty-four days and twenty-one hours, or in round numbers twenty-five days; and assuredly for getting cured of a disease so certainly fatal, without surgical interference so often fatal even with that, it is worth while for the patient to endure pressure upon the femoral artery for this length of time.

It is justly remarked by Mr Tuffnell, that if this length of time be contrasted with that required for the cure of deligation, the method by compression possesses many advantages over the latter.

From the hour or day that the patient with aneurism is admitted into hospital, till that in which the operation can be performed, in general one week must elapse. From the date of the application of the ligature to that of its detachment sixteen days longer must be given; and for closure of the wound and cicatrization, five days more may be allowed, making altogether twenty-eight days, under the most favourable circumstances, if there being no hemorrhage, no inflammation or sloughing or laceration of the sac, in short, no unfavourable accident. If it be remembered in how many instances of deligation, some of these catastrophes take place, or amputation requires to be performed, to give the patient a slight chance for life, few will hesitate to assign the preference to the method of treatment by compression.

That surgeons will ultimately adopt the method by compression for treating femoral and popliteal aneurism, Mr Tufnell speaks in the most confident terms. He entertains no doubt that it will become the general method of treatment. Truth, he says, ever has prevailed and ever will prevail. This is all very well, if in this obscure, confused, and uncertain state of existence, we knew and could tell what is truth. But as this is not likely to be the case in the course of the present age, we must leave the matter to be determined in the usual way. None can doubt, that, as the matter at present stands, it must be a great improvement to have a systematic and safe method of applying pressure in the case of arteries going to aneurismal tumours; and Dr Bellingham and Mr Tuffnell have certainly made out a strong case for the adoption of this method in the treatment of aneurisms affecting the lower extremities.

Dr Bellingham has examined with great learning and knowledge the question of the treatment of aneurism, and has adduced strong facts and arguments against the use of the ligature, and in favour of the method of compression. Mr Tuffnell has also collected a large body of evidence against the ligature and in favour of compression. Both authors, however, have overlooked in their investigation, certain circumstances, which, in our opinion, are so important, that no investigation can be complete without them. Both authors have shown by a plentiful induction from numerous facts that the application of a ligature to an artery, which has in its course an aneurismal tumour, is an operation which is in a large proportion of cases pregnant with pernicious consequences. They do not, however, inform the reader of the reasons, why it is so. Now this we conceive to be the great point for the surgeon to understand. An artery affected with aneurism is always an artery in a state of considerable disease. Its coats both above and below the aneurismal tumour, are either in a state of chronic inflammation, or present the effects of chronic inflammation, or they are in a state of sub-acute inflammation; the entire circulation and nutrition of the arterial tissues is completely deranged. No artery becomes aneurismal until it has been long previously in a state of chronic disease; steatomatous deposition, or what Dr Gulliver has shown to be fatty degeneration, osseous degeneration, and atheromatous disintegration. Then the aneurismal sac and the arterial coats above and below it are invariably reddened, softened, always brittle, sometimes lined with false membrane. We never yet dissected a case of aneurism either of the *innominata* or the arch of the aorta, without seeing the whole of the branches arising from them, all reddened, softened, and covered by false membrane; and invariably during life there is much pain along the course of these vessels. It is the same with aneurisms in the arteries of the extremities, excepting the single case where the aneurismal tumour is caused by a punctured wound. Examine also the course of these arteries, and invariably they are the seat of pain and uneasiness; they, in short, are the seat of a process of inflammation. In those instances, not very frequent we allow, in which death has taken place, either in consequence of aneurism of the extremities, or after the operation, the artery has been invariably found in a most unhealthy state. Rigid, thickened in the coats, with patches and rings of bone, with steatomatous and atheromatous deposit, the inner coat reddened, thickened, and softened, and peeling off from the middle coat, abrasions in various spots, the middle coat itself presenting steatomatous or waxy-like deposits, the bifurcations bulging out, while the channel and calibre of the artery is contracted and narrowed;—such are the common changes in arteries in the course of which is situate an aneurismal sac. Then what is the aneurismal sac itself? Is it not a mass of arterial tissues, brittle, torn, and utterly void of their natural qualities of elasticity, tension, and resistance. They no longer yield to contract again, but they give way by laceration. They no longer contract and expand according to the quantity of blood sent through them.

Besides this condition of the arterial tubes and their component tissues there is an unsound state of the blood. In this fluid the alkalescent predominance is subverted; it contains acids, sometimes one, sometimes another, in excess; and the effect of the presence of these acids, the result of irregularities in diet, excess and indulgence, and sometimes of mercurial courses, is not only to render the blood more prone than natural, to form deposits albuminous, fatty, and saline, but to irritate to a great degree the internal tunic of the whole arterial system. Conceive blood charged with much more carbonaceous matter than it ought to have, with uric acid, lactic acid, phosphoric acid, besides lime and other articles beyond the normal amount; conceive alkohol and various other articles absorbed and circulating, or, at all events, irritating and poisoning this blood; and then some idea may be formed of the original causes of aneurismal arteries.

Mr Tuffnell speaks, at page 32, in a strange manner of aneurism being generally supposed to be a disease slow in formation, slower at least, he says, than his own experience would lead him to believe. The inference from this is, that aneurism is a disease rapid in formation; and in proof of this he refers to an instance in which the artery in the form gave way, and thirteen days afterwards, the tumour, he adds, was the size of an egg (p 33). He afterwards notices the occurrence of a case which took place in the course of eight days, and in which the tumour increased in the course of forty hours to the magnitude of Florence flask (p 34).

It is not easy to answer for all the irregularities of surgical doctrine, and all the fancies in surgical pathology. But we cannot imagine any sensible surgeon of the present day believing, that the pathological circumstances which determine the production of aneurism, are rapid in course and recent in date. The arterial coats must have been long previously in a state of chronic disease, with occasional inter-current attacks of acute or subacute character. It is under these conditions that the tumour, which is a mere effect of the disease, is formed, and increases according to circumstances, rapidly or slowly. A sudden jerk or wrench, incautiously putting the foot down, a leap, unguardedly and suddenly extending the leg upon the thigh, may produce in one instant in such an artery an amount of laceration which will most speedily attain a great magnitude.

The practical deductions from all these facts are, that not only is the ligature not by any means so rational or safe a measure as was at one time thought, but even compression is itself and alone calculated to do mischief. Compression, nevertheless, must be allowed to a certain extent, to be a move in the right direction. But it proceeds not sufficiently far. No method can be expected to be serviceable in the treatment of aneurism, which does not combine the use of those measures which are calculated to remove, so far as they are removable, the morbid conditions of the arterial coats. The surgeon will require to adopt practice much more decidedly medical than he has hitherto done, if he wish to obtain favourable results even from tho use of compression. The great object which he ought to keep in view is to abate and diminish inflammation along the course of the affected artery, to put a stop to all sources of irritation, and to place the circulation, general and local, in a state as tranquil as possible. It is assuredly a great difficulty in the way of rational treatment, that patients with aneurism have generally been persons intemperate in habits, sensual, incapable of self-denial, or practising any of those restraints, which are not less useful to the health of the body than the energy of the mind. Here, therefore, the surgeon must meet with difficulties and impediments. At the same time, if he keeps in view the fact, that there is in the frames of these persons a general inflammatory state of the whole arterial system, probably a morbid condition of the blood, and a local inflammatory condition of one artery and set of vessels, he will see that, unless these conditions be removed or mitigated, he can expect beneficial effects neither from compression nor from any other mechanical contrivance. The medical treatment of aneurism, we must repeat, is by far the most important part of the duty of the surgeon; and before ten years more have elapsed, the truth of this principle will be recognized and avowed.

Art. III.—*Elements of Chemistry, Theoretical and Practical, including the most recent Discoveries and Applications of the Science to Medicine and Pharmacy, to Agriculture, and to Manufactures.* Illustrated by Wood-cuts. Second Edition. By Sir Robert Kane, M.D., M.R.I.A., President of the Queen's College, Cork, Director of the Museum of National Industry, Member of the Society of Pharmacy of Paris, &c. &c. &c. Dublin, 1849, 8vo, pp. 1069.

This work made its first appearance at Dublin in 1841; and it was in no long time recognised to be an excellent and serviceable treatise on the elements of Chemistry. It was indeed well received, not only in Ireland, but also in the United States.

The present is the second edition, and sustains with ability the character established by the first. It may be described as a judicious and faithful compendium of the doctrines, principles, and facts, of which chemical science at the present time consists. The author gives just views on the great leading doctrines; he gives a correct history of the different chemical elements and compounds, and their reactions; he takes care to show the application of chemical principles and chemical and physical facts in explaining the phenomena of the material world; and the phenomena and actions of living beings, vegetable and animal; and he has given full and correct accounts, so far as the limits of this work allow, of the chemical history of organic bodies generally. He shows also the applications of chemistry to various arts; glass-making, metallurgy, and agriculture.

We have perused the work with much pleasure,—many parts of it more than once; and upon the weight of this experience, we recommend it, not only to the student of chemical science, but to all those, whether professional or general, who wish to form just and enlarged ideas on the nature, purposes, and serviceable applications of chemistry and the chemical arts.

PART III.

MEDICAL INTELLIGENCE.

PHYSIOLOGY.

Experimental Researches on the Alkaline condition of the Serum of the Blood in Man. By M. Dr Cahen, Junior, (Sittings of Academy of Medicine, 9th July 1850.) Archives Generales de Medecine. Aout 1850, 4ieme Serie, Tome xxiii. p. 519.

It is known that the alkaline condition, which is constantly observed in the blood of all animals, and which also belongs to the blood of man, is an essential property of that liquid. It is connected to all appearance with the presence of salts of soda in the serum. When this alkaline condition is artificially altered the properties of the blood are immediately modified; and if it be annihilated the blood is equally quickly destroyed. M. Cahen has examined what are the modifications imparted to the blood by the increase or by the diminution of the alkaline condition of the serum. Then he inquires whether analogous alterations, which are observed in certain pathological states, are not owing to similar causes.

The first point to be established is that in the *plasma*, the living and circulating serum, the proportions between the dissolving agents and the dissolved elements are so exactly and rigourously combined, that the neutral azotized principles, the *fibrin* and *albumen*, cannot be distinguished in it from the other dissolved substances. But when the blood is withdrawn from the circulation there is established a departure or separation between these two bodies; the one of which, the fibrine, is spontaneously solidified, causing the curious phenomenon of the coagulation of the blood, while the other, the albumen, remains dissolved in the water of the serum, which further contains dissolved salts of soda with alkaline reaction.

It is impossible, without inducing a complete alteration in the nature of the liquids of the blood, to prevent coagulation from taking place; it is impossible, also, in the blood, to separate the albumen dissolved from the salts which seem to effect its solution. In order to dissolve the fibrine, or prevent it from being coagulated, it is necessary to have recourse to those salts, the absence of which produces the precipitation, the coagulation of albumen. This seems, therefore, to establish the fact, that, in the blood, these two forms of azotized compounds exist only under one single condition, in the state of alkaline solution, a state in which it is impossible to distinguish fibrine from albumen, as it is equally impossible to distinguish, according to M. Le Canu, after solidification, albumen from fibrine. In support of this proposition, M. Cahen recals the fact, that, according to M. Mulder, one sole and same principle, *proteine*, would be the bases of these compounds; that, according to Liebig and Scherer, albumen and fibrin would present the same elementary composition; that, according to M. Denis and his own experiments, it would be possible to transform at will fibrin into albumen and albumen into fibrin, and, at most, that it is easy to dissolve fibrin, and thus bring it to a state in which it is confounded with albumen.

This being established, it was important to see whether the means which nature employs be the same which the chemist puts in use in the laboratory; whether it is true that fibrin and albumen are only two different forms, two different modes of existence of the same principle. To answer this question come the experiments cited by the author, from which MM. Dumas and Boussingault, Bouchardat and Sandras, have drawn the conclusion that the neutral azotized bodies are only absorbed by animals, which assimilate these bodies to their own substance without being able to create them; and the researches of M. Bechard, which positively prove that these bodies enter into the organism only under one sole and same form, namely, that of albumen.

For a long time, however, and particularly since the researches of M. Andral on the blood, it is allowed, that, in the pathological state, the blood may present itself changed, either by an increase or by a diminution in the proportion of fibrine. M. Cahen endeavours to prove that these modifications of quantity are only the secondary expression of an alteration which acts upon the chemical qualities of the serum, and which consists in the increase or the diminution of its alkaline impregnation. Already the experiments of MM. Becquerel and Rodier have proved that the albumen and the fibrine of the blood are complementary of each other; that when the one is increased, the other is proportionally diminished. Upon this point the numbers, which result from the numerous analyses which these chemists have performed, leave no doubt. On the other hand, when we examine the analyses of M. Denis, we perceive in them that the quantity of the salts of soda has been diminished in the cases in which the fibrine has been increased. In reading the essay of M. Le Canu on the blood, we find that in diseases in which the fibrine has been diminished in quantity, the salts of soda and the albumen had, on the contrary, been remarkably augmented.

All these propositions which M. Cahen reproduces, ought to have been sufficient to establish by reasoning the conclusions which he wished to deduce from his own researches. He has examined comparatively the blood in the normal state, and the blood altered either by morbid causes or voluntarily, with the purpose of experimental inquiry; and he finds that the blood in inflammatory diseases is less alkaline than in the normal state, that in diseases with defibrination it is more alkaline than in the normal state. He attempted to ascertain the amount of these modifications of alkaline impregnation, by neutralizing by means of tribasic phosphoric acid the alkaline state of the serum; and he arrives at the following conclusions.

I. 1. In the sound state when the serum is in circulation, the *plasma* holds in solution or in suspension the substance which is ultimately to be distributed into albumen and fibrine.

2. The albumen and fibrine may be artificially transformed into each other.

3. The fibrine can exist with its proper characters in presence of a liquid containing a dilute solution of soda, and at the temperature of 40° Cent. = 104 Fahrenheit. It appears, then, to be constantly transformed into albumen.

II. 4. In inflammatory diseases the fibrine of the blood is increased; the albumen is diminished.

5. The augmentation of the fibrine is equal to the diminution of the albumen.

6. The salts of soda are in smaller proportion in the serum.

7. The addition of a small quantity of a solution of soda appears to re-establish the normal proportions.

8. The serum is less alkaline than in the normal state.

9. The increase of the fibrine in inflammatory diseases is owing to the diminution of the alkaline impregnation of the serum.

III. 10. In putrid diseases the fibrine is diminished in quantity.

11. The salts of soda are in greater proportion in the serum.

12. The serum is more alkaline than in the sound state.

13. The diminution of the fibrine in putrid diseases is owing to the increase of the alkaline state of the serum.

14. Finally, inflammatory diseases with augmentation of fibrine would be connected with a diminution in the degree of alkaline impregnation of the serum; putrid diseases with diminution of fibrine with augmentation in the alkaline condition; and as it is very easy to modify at will the degree of the alkaline impregnation of the serum, M. Cahen specifies the therapeutic consequences which result from his researches.

Before expressing in absolute terms these consequences, he is desirous to wait until facts more numerous than those which he has yet been able to collect, give to his presumptions that sanction which is still wanting to them, namely, the sanction of time and experience.

Abstract of a Lecture on Electro-Biology, delivered at the Royal Institution, Manchester, on the 26th March 1851. By JAMES BRAID, M.R.C.S., Edinburgh, C.M.W.S., &c. &c.

On Wednesday evening the last of the conversazioni for this session took place at the Royal Institution, Mr Alderman Watkins in the chair, when Mr Braid read a paper on "Electro-biological phenomena, physiologically and psychologically considered." The audience was large and respectable.

Mr Braid commenced by stating that his essay comprised the results of his own experience in the investigation of the reciprocal action upon each other of mind and matter. His chief object was to give an explanation of the phenomena lately exhibited in Manchester, Liverpool, and surrounding towns, in London, by Mr Stone; and in Edinburgh and Glasgow, and other towns in Scotland, by Dr Darling, on what was termed "electro-biology." These exhibitions had excited much interest.

After reading extracts from an article entitled "Experiments in Electro-biology," in *Chambers' Journal* of Feb. 8, 1851, describing some successful experiments of Dr Darling on a previous sceptic on the subject, Mr Braid proceeded to notice his own experience. Nine years ago he entered on the investigation of mesmerism, believing it wholly a system of collusion or illusion; but he soon discovered a reality in some of the phenomena, though he differed from the mesmerists as to their causes. His experiments proved that similar phenomena of abnormal sleep, and peculiar condition of mind and body, might be self-induced by fixed gaze on any inanimate object, the mental attention being concentrated on the act. This proved the subjective or personal nature of the influence, and that it did not arise from any magnetic influence passing from the operator into the patient, as alleged by the mesmerists.

Mr Braid appealed to the result of his experience nine years ago, in sending numbers of subjects into a state of sleep, by causing them to gaze continuously at inanimate objects. Thus the potency of his method he had demonstrated on the 8th December, 1841, before a Manchester audience of eight hundred individuals, when fourteen male adults came forward, all strangers to him, who had never been so tested before. Some were desired to keep a steady fixed gaze upon the end of a cork bound upon their heads, so as to project from the middle of the forehead, each to look at the cork bound upon his own forehead, and to fix his undivided attention on the act. Some were desired to fix their sight and thoughts on points of the gas apparatus in the room. All commenced the process at the same time, and ten of the fourteen went into the sleep, whilst he had never touched any one of them until after their eyelids closed involuntarily. None of them were able to open their eyes, some became cataleptic, others were insensible to the prick of a pin, and one or two forgot all which had occurred. During these proceedings, three more of the audience sent themselves into the condition, by fixing their gaze and thoughts upon points of the room, according to what he had indicated during his lecture, as sufficient to produce the sleep. Mr Braid knew nothing of their acts or intentions until called upon by their friends to unlock them from their profound sleep, from which they could not succeed in arousing them.

He was also equally successful in operating upon a number of strangers together, at a private conversazione given to the profession in London, in March 1842, sixteen out of eighteen having passed into the sleep, simply by maintaining a steady fixed gaze, and fixed act of attention, whilst gazing at the root of a chandelier. Mr Herbert Mayo tested them, and ran a needle from the back to the palm of the hand of one patient without the patient evincing the slightest consciousness of pain or remembrance of it after awaking. Mr Braid appealed to these facts, and many of a similar character, and to the feats of the Fakirs of India in this respect for the last 2400 years, and then added, "Inasmuch as similar results arise from all these personal acts, there can be no reason to doubt that the influence is essentially subjective or personal, and not the transmission of any magnetic or occult influence passing from the operator into the patient, which the mesmerists contend for,—and that the subsequent results are merely modified or intensified by others, by suggestions or impressions conveyed to the subjects through words spoken within their hearing, and other physical impressions acting on their organs of special sense. The condition (he further added) is essentially one of mental abstraction or concentration of attention, in which the powers of the mind are engrossed, if not entirely absorbed, with a single idea or train of thought, and concurrently rendered unconscious of, or indifferently conscious to, all other ideas or impressions."

In the condition of mental abstraction, or concentration of attention, thus produced, the imagination becomes so vivid as to invest with present reality whatever idea arises spontaneously to the mind, or is suggested to it by some person on whom the subject's attention has been specially fixed. The oftener these phenomena are excited the more easily may they be reproduced, through the laws of association and habit; and some patients may at length become so impressible as to be liable to lapse into the condition entirely through the force of imagination and fixed belief that some process is throwing them into the state, though no such be in operation. This he regarded as a great source of fallacy with those who assert that they possess the power of influencing patients at a distance through mere volition or secret passes.

Mr Braid observed, "It is an undoubted fact, that there is great difference in the susceptibility to the mesmeric impression, some becoming rapidly and intensely affected, others slowly and feebly so. This want of uniformity in the results has been seized upon by sceptics, as a warranty for their suspecting the whole phenomena manifested to be a tissue of collusion or illusion; whereas, when viewed in the light in which I advocate the science, as the result of a subjective or personal influence, we ought naturally to expect as great difference in the results as there are differences in the mental and physical constitutions of the patients subjected to the processes. Upon this principle, therefore, I contend that the variety manifested by different individuals is the strongest proof of the genuineness of the phenomena."

Mr Braid then explained, that in some patients who went into a deep state of the sleep, "the imagination seems to assume a supremacy over the reason, will, and natural functions of the organs of special sense, and the concentrated state of mind enables them readily to be imposed upon, and induced to act out their dreams excited by suggestions, precisely in the manner referred to by Dr Abercrombie, in the case of the officer, who could be made to talk in his sleep, and be convinced of anythiug by his fellow-officers, or even led to act out the most foolish suggestions of his companions. The sense in action may, through suggestion, be rendered inordinately active, or its natural function may be temporarily suspended by mental impressions strongly imprinted on the minds of the subjects by repeated and appropriate suggestions. In short, in this condition, the mind seems aeady to accept as truth, the first suggestion, and, from its abstractive tendency, becomes some absorbed with that, as to be dead, or comparatively indifferent to all else, during the dominance of that idea or train of thought:—a state similar to what is witnessed in individoals noted for absence of mind." He then went on to explain that some individuals manifest this condition of mind even before they close their eyelids or fall, into the state of sleep, and that these subjects had long been known in this country to exhibit the "vigilant or waking phenomena" now brought forward by Mr Stone and Dr Darling as something new under the name of electro-biology."

Mr Stone caused his patients to gaze continuously on a zinc disc, with a spot of copper in the centre, held in the hand for ten or fifteen minutes, silence being enjoined, and the patients to keep their mind fixed on the act during that period. Those who showed no symptoms of being affected at the expiration of that period were desired to retire, as not being suitable subjects for manifesting the phenomena. The mode of operating with susceptible subjects was this—the lecturer desired the subject to close his eyes, and then said aloud to him, "Now you cannot open your eyes," or desired him to sit down, and then predicted he would not be able to rise from his chair; or to stand up, and then audibly predicted that he would be unable to sit down; or gave him a glass of water, and then suggested alond that it was wine, beer, spirits, vinegar, milk, coffee, tea, and so on in succession, when the patient would become influenced and deluded, according to the suggessions of the operator, until some audible, or visible, or tangible signal from the fascinator broke the spell. Mr Braid said that startling as these alleged pretensions might seem, nevertheless he knew, from ample experience that these and many other equally extraordinary phenomena could be produced in some individuals, without the slightest collusion or intended fraud on the part of such subjects; but he contended that they were to be accounted for, not as the result of any electric influence, but as examples of the power of imagination, easy credulity, and fixed mental attention, over a certain class of subjects. Mr Braid proved, by quotations from his work, on "The Power of the mind over the body," published in 1846, that he had fully investigated this subject at that period, and proved the existence of this law of the reciprocal action and reaction of the mind and body upon each other, to his entire satisfaction; and his experiments had moreover proved, that wherever the mind is strongly and continuously directed, it changes the sensation and circulation in the part so regarded, and the more so according to the faith of the patient and vividness of his imagination, and belief in what is to happen. This he considered was the grand source of fallacy regarding Baron Reichenbach's alleged "new imponderable," or odyle force. The only test of this alleged force was admitted to be the human nerve, but, inasmuch as the mind of the patient must always constitute an element in the test of the results realised, he (Mr Braid) could not consider it a satisfactory test, because the influence of the mind alone was sufficient, in sucn patients, to produce the results attributed to this alleged new force.

Mr Braid then called attention to the fact that the process of these

Americans is merely a variety of his old process for inducing what he called the hypnotic or mesmeric state; he remarked that the copper and zinc were "merely visible and tangible objects for aiding the patients in fixing their attention, and inducing that state of mental abstraction which is the real origin and essence of all that follows. I know from experience," he added, "that any other object would be equally efficient, provided the patients were impressed with that conviction. The auricular or audible suggestion and other impressions resorted to by these experimentalists (for they speak aloud within the hearing of the patient, the idea or act which they wish and intend to be manifested, or give some visible signal or tangible impression to excite ideas and actions in their subjects), are merely modes of influencing the minds of their patients, and of reflecting the habit of concentrated attention, superinduced by the first process, from one idea or purpose, and fixing it on another; and the expression, by the experimentalist, of 'all right,' or a nod of his head, or other manœuvre, for dissipating the existing delusion, are merely different modes of breaking down the previously existing ideas,—just as a tap upon the shoulder will restore to consciousness of all around the individual who was so rapt in mental contemplation as to have passed his friend without recognition, or been insensible to what was being said or done in his presence previously. Now, the repetition of these audible, visible, and tangible suggestions being requisite to insure the results, is a clear proof that the influence is psychical or mental in its nature, and that it is not a physical or electric influence, as the electro-biologists allege. For, if electric, there ought to be no more need for their auricular suggestions and manœuvres to produce the results on the patients, than there would be for such to insnre the one side of a Leyden jar being charged negatively with electricity when the other is being charged positively, or for the attendant to speak aloud to the electric telegraph the message which he wishes it to convey. The few occasional examples adduced by them, in which they allege that they can convey their behests to subjects silently and unseen, through pure sympathy, and the power of their will, I consider inadequate to sustain their hypothesis. At best they are but exceptional cases; and when I have had opportunities of testing such patients I have soon been able to demonstrate the source of fallacy which had misled the operators."

Mr Braid further added, "It is a well-established physiological fact, that the moment the trunk of a nerve is divided, all sense and voluntary motion is abolished in parts supplied by such nerve beyond the point of section. Now, are we to believe that it could be possible that such a degree of sympathy could exist between different individuals as to enable one, by the exercise of his volition, or other silent and unseen manœuvres, to force his own nervo-vital influence beyond his own organism, so as to control the acts of the other at a distance, even when miles apart, when he could not propel it a fraction of a line beyond the section of the nerve in his own limb (the divided ends of the nerve being in close apposition), so as to produce a voluntary movement of his own member?"

After quoting at length a series of experiments given in his work on "The Power of the Mind over the body," published by Mr B. in 1846, experiments in every respect similar to those of the electro-biologists, and performed on individuals whose character placed the facts above suspicion of complicity or trick in the manifestations referred to, Mr Braid made the following quotations from the above work.

"Not only may patients in the waking state be made to believe that they see various forms and colours, and perceive variable sensible impressions, and irresistible powers, drawing, repelling, or paralysing them, from a strong mental impression, changing the physical action of the organ or part usually engaged in the normal manifestation of such functions, but I have, moreover, ascertained that the same influence may be realised in respect to sound, smell, taste, heat, and cold, in some excitable subjects when wide awake, without any actual objects; and merely by asking what tune, odour, animal, or substance the subject *now* perceived, the ideas thus suggested were frequently totally different from those in my own mind at the time." And again: "The true cause of these phenomena is not a physical influence from without, but a mental delusion from within, which paralyses their reason and independent volition, so that, for the time being, they are mere puppets in the hands of another person, by whom they are irresistibly controlled, so that they can only see or hear, or taste or feel, or act in accordance with his will and direction. They have their whole attention fixed upon what may be said or signified by this alleged superior power, and consequently perceive impressions through the excited state of the organs of sense, called into operation, which they could not perceive in their ordinary condition. It may have been interesting enough to have demonstrated that the human mind could be so subjugated and controlled, but I do not consider that the continual repetition of such experiments, in the waking condition, is at all proper, or free from the danger of throwing the faculties of the minds of such patients into a morbid condition." Mr Braid added, "The processes, however, when prudently and skilfully conducted, are perfectly harmless, and are moreover, capable of being turned to the happiest results in the relief and cure of several affections, which are most intractable or altogether incurable by the ordinary modes of treatment, by the exhibition of medicines. By the former mode, we can excite or depress the state of sensation and circulation, locally or generally, and consequently the functions of any organ or part in a most remarkable degree, according to the mode of procedure, and the mental suggestion resorted to in each individual case, so that in this way morbid delusions may not only be excited but cured in many instances, not only as regards the faculties of the mind, but also as regards the functions of the body. Whatever function can be paralysed or perverted by a given mode of procedure, and suggestion, and manipulation, may be invigorated and corrected by an opposite mode of management. This may be still more remarkably verified in patients who pass into the sleep."

It was for the public to judge whose theory of the phenomena was correct, his own mental and suggestive theory, or their electric theory. The repetition of audible, visible, and tangible impressions being requisite to insure the results, was a clear proof that the influence was psychical or mental in its nature.

Mr Braid then made the following remarks:—"I am as well aware as any sceptic can be that many of the phenomena manifested by such subjects, both when asleep and in the waking condition, are capable of being feigned. Indeed, I set about the experimental investigation of the subject with the full conviction that there was imposture, and with the determination, moreover, if possible, to discover and expose the trick. With such evidence as presented itself before me, however, of the genuineness of the phenomena, as exhibited in parties known to me to be possessed of the strictest probity, honour, and Christian principle, it became impossible for me, with a proper regard for candour and honour, to persist longer in a course of dogmatic scepticism. I therefore confessed that my former notions had been erroneous, and set about the further investigation of the subject, with the honest desire to arrive at truth. It is important to remark, however, that these waking phenomena prove that a strongly fixed idea of determined scepticism may so possess the mind of an inquirer, as to render him a totally unfit person to be a valid witness in what are matters of plain fact and observation to those who are not so enslaved by prejudice. His imagination and fixed conceit may be so powerful and engrossing that, unconsciously, he is forced to interpret the ideas of his own mind as the facts, instead of what is actually presented before him. This view of the subject throws an important light upon the nature and value of evidence, in cases where parties point blank contradict each other, when describing occurrences of which they have both been eye-witnesses. A strong mental impression or prejudice may have deceived one or more witnesses, without the slightest intention to misrepresent facts.

The writer of an article in *Chambers' Edinburgh Journal* for the 8th of last month, Mr Braid allowed, to a certain extent, had hit upon a true solution of the cause of the waking phenomena, viz., that it was a play upon the will of the patient, and the influence of sympathy and imitation upon certain individuals. "This theory," he said, "readily accounts for all the phenomena in which muscular motion is concerned, but it does not at all account for a much larger and more surprising class of phenomena, viz.:—suspending, increasing, or perverting impressions addressed to any or all of the organs of special sense. These results are to be accounted for only by an appeal to the power of an over-excited and vivid imagination and fixed idea changing physical action. Those who suppose that the power of the imagination, and sustained mental attention, directed to any part of the body, is a mere *mental* condition, without being accompanied by any change in the physical organism, labour under a grave mistake. Sustained mental attention, directed to any part, changes both the sensation and circulation of the part so regarded; and in a more marked degree, according to the imagination and belief of the patient. From this cause the most grave and fatal diseases may be engendered; and by withdrawing the attention and fixing the train of thought on some *new* object or pursuit, relief and cure may be effected in cases which would utterly fail without such management of the mind."

The lecturer then gave the following explanation:—"Voluntary motion arises from a mandate of the *will* giving a special direction to the nervo-vital influence, so as to excite into action the class of muscles which naturally produce such motion, whilst their antagonists remain passive. In these electro-biological experiments, however, the suggestion of the operator excites a greater flow of nervous force into the class of muscles which produce the action *suggested*, than the patient is able to throw into the opposite class. Both classes of muscles, therefore, are called strongly into action. But the suggested idea being the stronger, there is no efficient voluntary motion, notwithstanding a great amount of nervous influence may be expended by the patient, as evinced by his rapid exhaustion. Thus, he lately led a patient to suppose that a walking stick was so heavy that he could not support its weight; and, after struggling some time with misdirected muscular efforts, he fell on the floor, quite exhausted by his efforts to support the imaginary load. Most people must have experienced a similar feeling and result from an attack of nightmare during common sleep. The struggle and exhaustion in both cases are analogous. On the other hand, if the suggested idea and strongly fixed belief go along with the will of the patient, his volition may thereby be so much intensified as to enable him to lift a weight which he would be quite incapable of doing in his ordinary state. The history of cases of panic in the army from slight causes, and deeds of daring, and achievements almost superhuman during fits of enthusiasm, are examples in point, on a large scale." Neither a play upon the will, nor sympathy, nor imitation, can account for patients feeling insufferable heat or cold, or for having the organs of sense paralysed or perverted by an audible suggestion; but a strongly-fixed idea and vivid imagination are quite adequate to produce such results as witnessed in monomania, delirium tremens, intoxication, narcotism from opium, the hachisch or bangue of the East, and of other drugs, as well as in various morbid conditions. "In all these states," he added, "it is a well ascertained fact, that ideas may become so vivid as to assume all the force of reality; and that whilst the individual so affected retains a certain amount of consciousness of all around, still he cannot emancipate himself from the erroneous impression, or that he may be so engrossed with the one idea as to be dead or indifferent for the nonce to all other impressions."

Mr Braid then gave his views of the so-called mesmeric passes, whether by contact or non-contact. The mesmerists allege that the effects arise from some occult or magnetic influence,—the odyle force of Baron Reichenbach,—affecting the part in a particular manner. He attributed it to the mental power in the patient to change the physical action of the part to which his mind is continuously directed by a sensible impression or audible suggestion from another person, or by an effort of the patient's will, especially if done in the belief of some change being about to happen. One of the most puzzling classes of phenomena was that exhibiting reverse results, apparently arising from the same sensible impressions—as the mesmerising and demesmerising passes. But he found that, on first going into the sleep, patients had sufficient mobility to be affected by certain impressions, and would approach to or recede from them, according as they were agreeable or the reverse in quality or intensity. Thus by titillating the skin, or agitating the air over it, the adjacent muscles are called into play, so as to bend the hand and raise the arm; and by similarly stimulating the opposite class of muscles, the hand and fingers become extended, and the arm falls. He subsequently ascertained, that a class of muscles thus called into action and allowed to remain a short time in one position, a repetition of the impression on the same points which had produced the action, would now reduce it. At length he discovered the solution of the apparent mystery. The movements being instinctive or automatic, the impression merely gives a tendency to indication; the direction and character of the motion being the most natural motion under the circumstances. Thus, if a muscle is passive, it will become active, and *vice versa*, from the same exciting cause. If an impression be made on the hand or arm, on the patient's lap, as it cannot descend it will rise and become rigid: but, after remaining awhile in that condition, a like impression will induce the most natural motion,—in this instance to descend. If an obstacle be interposed to prevent its rising or descending, and the impression be repeated, it will move laterally. This mode of exciting action by sensible impressions may be confined to individual muscles or classes of muscles, and thus the muscles of expression may be so acted upon as to waken any passion or emotion in the mind,—a mere inversion of the sequence which ordinarily obtains between mental emotion and the physical manifestations of such emotion. "That there is nothing occult or specific in the pass with the hand is manifest from this, that a similar agitation of the air by the blast from a pair of bellows will produce precisely similar results as the like current of air from the wafting of the human hand, as I have proved to the entire satisfaction of hundreds of intelligent individuals." But if with each touch, or agitation of the air, the operator aloud declares what should happen, this suggestion may be so strong as to cause the predicted manifestation to be realized, instead of the natural result. Thus we may have manifested an artificial as well as a natural set of phenomena, according to the mode and intention of the operator. Then some subjects, during the sleep, see through their partially closed eyelids, and thus catch the suggestion of even a fixed gaze by the operator on a leg or arm; and, imagining a movement of such limb is desired, their docility will obey the suggestion. In like manner, the remarkable tendency to sympathy and imitation in such patients, will induce them to observe and imitate every physical act of the operator. If a screen be interposed between them, the patients will rely on hearing instead of sight, and be only occasionally correct in their imitation of physical acts. All these phenomena may be realized without the patient intending deception on others, or having any remembrance of the facts, on coming out of the sleep.

Mr Braid then remarked that "he had never seen any phenomena, during either the hypnotic or mesmeric sleep, or during the state for manifesting the vigilant phenomena, which were not in accordance with generally-admitted physiological and psychological principles." The senses and mental powers may be torpified or quickened in a remarkable degree, but he had never seen the clairvoyance which would enable patients to read through decidedly opaque bodies, and some other of what have been called by mesmerists the higher phenomena. He, however, referred to apparently very astonishing feats which had occurred in some of his patients in imitating words and music of which they were previously quite ignorant, also of the exalted power of smell, and of the muscular sense which enables them to write and draw with some neatness without the use of their eyes; quickened hearing and exaltation of some of the mental powers, as was manifested by second-sight men in the Highlands of Scotland, and then added, "several important inferences may be drawn from what has been adduced regarding the power of the imagination, belief and fixed act of attention in changing and controlling physical action, and of the state of the body thus superinduced reacting on the mind. It not only enables us to comprehend, upon scientific principles, the cause and cure of many diseases, where there has been no specific and adequate external physical agency to account for the results, but it also explains many phenomena which used to be attributed to demonology, witchcraft, ghost-seeing, being spell-bound, the power of the *obi* women who could cause their credulous victims to wither and die under their assumed malign power and malediction, the power of charms, spells, and amulets, of Perkins's metallic tractors, the efficacy of galvanic rings, bread pills, and such-like. It also explains the alleged clairvoyance of the Egyptian boys, after looking steadfastly at an inky globule held in the hands, narratives of which have been published by Lord Prudhoe and Mr Lane; the revelations of Kelly, recorded daily for Dr Dee, who was warden of Manchester during the reign of Queen Elizabeth, and which were alleged to be revealed to him by a spirit whilst gazing into Dr Dee's celebrated show-stone; the fortune-tellers, who exercise a similar mode of looking into futurity by gazing into an unground glass egg, and the late revelations of the same sort published by Zadkiel in his almanac for this year, as the revelations of the angel in Lady Blessington's magic crystal, all come under the same category;—merely the figments of fancy, excited by questions or otherwise, set down as visions seen and answers audibly uttered, or written in visible characters before them, by the said alleged spirits. We also thus acquire this salutary lesson, that in order to have a healthy state of mind and body, it is requisite that *all* our faculties should be duly cultivated, and that the attention should not be devoted too long and exclusively to any one object or pursuit, as the latter course has a tendency to engender a morbid state of mind as well as of body. Hence the advantage of relaxation and amusements of various kinds, so long as they are pursued in reason and with moderation. We are also taught this important fact, that dogmatic scepticism, or prejudice, not only beclouds the reason, but also destroys or perverts the perceptive faculties. This truth seems to have been clearly perceived by Dugald Stewart when he penned the following notable paragraph:—"Unlimited scepticism is equally the child of imbecility as implicit credulity." Mr Braid concluded, —"My experiments have proved that the ordinary phenomena of mesmerism may be realized through the subjective or personal mental and physical acts of the patient alone, whereas the proximity, acts, or influence of a second party would be indispensably requisite for their production, if the theory of the mesmerists were true; moreover, my experiments have proved that audible, visible, or tangible suggestions of another person whom the subject believes to possess such power over him, is requisite for the production of the waking phenomena, whereas no audible, visible, or tangible suggestions from a second party ought to be required to produce these phenomena, if the theory of the electro-biologists were true. There is, therefore, both positive and negative proof in favour of my mental suggestive theory, and in opposition to the magnetic, occult, or electric theories of the mesmerists and electro-biologists. My theory, moreover, has this additional recommendation, that it is level to our comprehension, and adequate to account for all which is demonstrably true, without offering any violence to reason and common sense, or being at variance with generally admitted physiological and psychological principles. Under these circumstances, therefore, I trust that you will consider me entitled to your verdict in favour of my mental theory."

M. Caplin opened the conversation by speaking of what he conceived Mr Alfred Smee had proved in his work on electro-biology, and detailing some experiments he had himself made on a little boy, who was then in the room, with their results. The boy had been afflicted with paralysis of one limb since he was sixteen months old; he (M. Caplin) had brought him completely under his control as a subject of electro-biology, and with the happiest results; he was fast acquiring strength, and the paralysis was giving way. He did not believe that the effect produced by the placing of coins in the hand was at all galvanic, but that the heating of the coins produced an electrical disturbance, indicated by certain palpitations of the muscles, as the disturbance went on from the head to the extremities. He offered that the boy should be operated upon in the presence of the audience, but it was against the rules of the institution.—Mr Braid, in reply, said that Mr Smee's theory was so fanciful, and subjected him to such severe criticism, that he sought to shelter himself by taking legal proceedings against those who analysed his views. He conceived that there was no need of any outward manipulation, or means of fixation; for people could throw themselves into a condition of mental concentration; and as to the movement of the hand, it was merely the effect of concentrated mental attention directed to any part of the body. He had proved this by experiments on four gentlemen (two of whom were then in the room), when experimenting on Baron Reichenbach's "new imponderable." They were seated, each with his arm on the table, and they were requested to maintain a steady fixed gaze each on his on hand and watch the result. He knew that of the four senses of the hand,—heat, cold, common sensation, and muscular sense,—that most prominent in the individual would be brought out, provided he had no consciousness of what was to be expected. After a time one felt a cold sensation stealing over his hand, another felt a pricking sensation, as if sustaining galvanic shocks, the hand of another was hot, and the fourth became cataleptic, and the hand and arm were fixed to the table. Now, this was the power of the mind in the individual directed in each case. He did not doubt the value of the concentration of mental power as a remedial agent in the case of paralysis, if there was not organic disease. A woman that very day, labouring under paralysis, he had relieved in the course of ten minutes, and enabled her to raise an arm which she could not previously move. As we can suspend the power of muscle, so can we increase or intensify it, by a suggestion. There were instances of parties having wrenched iron bars from windows under great mental excitement; and during the fire in Market-Street, a friend of his rushed into his room, tore out an iron safe containing his books, and dragged it out of the office, a task which it would have been impossible for him to effect, except under intense mental concentration and excitement. As to the agency of electricity, there was no thought without a change of the cerebral matter, and no change in that without a certain disturbance of the electrical influence; but in that case the thought was the cause of the disturbance, and not the electricity the cause of the thought.

Mr Catlow said they had omitted to propose a vote of thanks to Mr Braid for his paper, and perhaps such a motion would come well from himself. He congratulated Mr Braid on having come round to a common sense view, well adapted to a popular audience. Mr Braid started originally with the theory that fixed gazing at some object, until the muscles of the eye were strained, was an absolute necessity in the production of these phenomena, and said nothing about the mind.*

Dr Hodgson thought Mr Braid was not to be disparaged for having changed his views after nine years of study; he was rather to be praised for his candour. He conceived that Mr Braid's explanation of electro-biological phenomena was satisfactory. Mr Stone might have the power of producing certain phenomena by silent volitions of will, but he did not do so in public, nor, indeed, could he well do so. He (Dr Hodgson) could not, however, go so far as Mr Braid in respect to mesmerism. His theory would not account for many apparently well-authenticated phenomena.

Mr Prentice said a few words respecting an exhibition he saw at Mr Braid's house, at which a factory girl very closely imitated a lady who sang difficult music in several languages, so closely that the tones of voice of the two could scarcely be distinguished, He believed the clairvoyant cases were wonderful guesses arising out of suggestions. The Chairman confirmed Mr Prentice s remarks, from what he had personally witnessed at Mr Braid's, by the above patient imitating accurately words and music unknown to her.

Dr Shelton Mackenzie also said a few words as to his personal experience in this matter, confirmatory of Mr Braid's power of suggestion, as witnessed by him in the case of a boy, and also on his own person.—The vote of thanks was passed and the meeting broke up.

OBSTETRICS.

Cases of Cæsarean Section.

1. *Cæsarean Section.* By Thomas Radford, M.D., F.R.C.P., Edinburgh, &c., &c., &c.—*(Unsuccessful.)*

On Tuesday evening, February 21, 1841, Mr Dunn, surgeon, of Manchester, and Mr Goolden of Stockport, called upon me to request my opinion on the case of Mary Forrest, who resided at Stockport. She was the patient of the latter named gentleman, from whom I learned the following particulars.

He had visited her at 1 o'clock P.M., the day before (Monday). She was at the full period of gestation, and had violent and regular pains in the back. Mr Goolden made a vaginal examination, and found the pelvis very much distorted; he thought she could not be delivered unless by the Cæsarean section. A grain of opium was ordered to be taken every two or three hours, until the pains abated, which happened after six doses had been taken. When Mr Goolden visited her on Tuesday morning he found her nearly free from pain. Her bowels being constipated, some pills, composed of aloes and calomel, were prescribed. He again examined her *per vaginam*, and concluded that her delivery was impossible, except by the means already stated. He further said on the evening of this day (Tuesday), when at my house, that she was now entirely free from pain, and on inquiry said he did not think that labour had commenced. The object of his coming to Manchester was to request me to visit the patient the following day, and examine the pelvis, so that clear and definite views might be had, and what course should be adopted when labour came on.

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* In his first lecture, on the 27th December 1841, Mr Braid referred to the state of the mind, respiration and circulation induced by the fixed gaze; and on the 8th December 1841, when the fourteen patients were tried for the first time, they were "directed to preserve a steady gaze, and *as far as possible, to abstract their minds from everything going on around them.*—Vide *Manchester Courier* and *Guardian* of Nov. and Dec. 1841.

On Wednesday I accompanied Mr Dunn to Stockport. We found Mary Forest in bed, and so helpless as to be unable to turn herself. Her counteuance was short and inexpressive; her lips thick; her eyes bluet on the cornea of the right eye there was a considerable opacity, the result of an injury from having been struct by a shuttle. She had been employed as a power-loom weaver in a cotton factory. Her age was 38 years. This was her third pregnancy, though an unmarried woman. Her first labour, which was natural, happened nineteen years since, and the child was a boy. About eighteen months before her present labour she became pregnant a second time, and aborted at the end of two months. She had suffered during the last five or six years violent rheumatic pains, bnt otherwise her health had been good until within the last few months. Her stature had become considerably less, and her legs and thighs were very œdematous. She said she felt the movements of the infant, which on first placing my hand on the abdomen, I thought I perceived; but keeping it steadily applied, I soon found that it was only slight contraction of the uterus. The stethoscope was used, but gave us no evidence of its being alive. The abdominal parietes were extremely thin, and felt very flabby The uterus projected very much forward, and lay over the *symphysis pubis* to such a degree, that when the patient was placed in a sitting position in bed its anterior eurface rested on her thighs. Her breech was gibious, and her thighs approximated considerably more than natural. The discharge from the vagina was of a dark colour, and had a putrid smell. Her constitutional condition was very bad; pulse 140; tongue furred; great thirst; continual vomiting; great abdominal tenderness and tension; bowels not moved for two days.

By a vaginal examination the pelvis was found to be considerably distorted, the outlet was so much diminished as to render it dificult to pass the hand, in order to ascertain as precisely as possible the measurement of its several parts. The arch of the pubes was nearly destroyed by the near approximation of the rami of the ischia and pubes, there being only a narrow slit which just admitted the point of the finger. Between the tuberosities of the ischia I could barely place three fingers. The coccyx was considerably incurvated upwards and forwards. The brim wcs tripartite in figure, or composed of three divisions. This altered shape was produeed by the upper portion of the sacrum, and the last lumbar vertebræ standing so very much forewards and downwards, inclining a little more to the right side, and by the body of the *ossa pubis* and *ischii* being forced backwards and inwards, and the *rami* and *symphysis pubis* jutting forewards. On the sight side I could just place the point of the index finger, and on the left I could pass two fingers, one lying partially over the other. Neither the presentation of the child or the *os uteri* could be felt.

Although my attendance was specially requested to explore the pelvis in anticipation of labour, and conclude on the measures which must be adopted when it supervened, we were compelled now to decide on her delivery, as she was, and had been, in labour since Monday, when the membranes must have raptured, as I ascertained she had a dribbling watery discharge afterwards. We unanimously agreed that she could only be delivered by the Cæsarean section. Whe we apprized the patient of our decision, she readily consented to submit to any plan we considered necessary. An enema was administered, but it did not act. The catheter was passed, and about an ounce of urine withdrawn; afterwards I placed the hand on the abdomen, and found still a fluctuating tumour, which induced me to pass a longer catheter, and by a careful manipulation it was carried higher, and succeeded in further removing a considerable quantity of urine.

In the first place, we arranged the duty which each gentleman had to erform. Mr Cheetham and Mr Pigott joined us to witness the operation, I commenced by making the incision a little above the umbilicus on the left side of the *linea alba*, and extended it downwards towards the pubes, so as to be about six inches in length. In consequence of the very attenuated state of the abdominal parietes the uterus was at once exposed, and its tissue partially cut. It was necessary to raise the deflected uterus upwards before the external incision was made. About a pint of water, with a large portion of intestine escaped. This portion of bowel, which had been dangerously exposed to be wounded, being effectively drawn aside by Mr Dunn, I fully divided the uterus in the line of the wound first made into it. The placenta was now exposed, the greater part of which lay more towards the right side of the incision, and maintained its adherence, whilst that on the left (the smaller division) was separated by the contraction of the uterus. Mr Dunn immediately passed his right hand in search for the feet of the infant, and his left along the body to guard its neck from being spasmodically seized during its abstraction (a caution given to him by me) having in a previous case met this disaster. Having gained firm hold of the feet of the infant, he very cautiously and expiditiously drew the body forth, until the neck came to pass, which was then firmly grasped by the uterus, and the head thereby detained. The womb had an appearance as if it was indented, and strongly reminded us of its condition in hour-glass contraction. The difficulty at last overcome, the infant (dead and partially putrid) was completely removed. The adherent portion of placenta was detatched, and wholly extracted. Not more than a few onnces of blood were lost. The intestines were much distended with air, and were difficult to keep in position during the operation, and could not be replaced or retained after it until the wound was contracted by sutures. Their peritoneal coat was highly inflamed. The edges of the wound were brought together by interrupted sutures, and maintained by straps of adhesive plaster, and supported by a bandage placed round the patient. She bore the operation with great fortitude, and indeed scarcely made a complaint during its performance. Afterwards she said she had not suffered so much pain as she had felt from some of the unavailing parturient pains. She now expressed herself as being very comfortable.

Nine o'clock P.M.—Considerably worse; pulse 140; tongue furred; great thirst; vomits continually; surface cool; countenance anxious; great tenderness of the belly; clyster not returned; had no sleep; a little urine passed.

Ordered to take one grain of Acetate of Morphia.

Thursday 23d.—Two o'clock A.M.—Mr Goolden visited her; pulse 160; vomiting unabated; matter rejected of a dark colour; skin rather warmer; breathing quick; belly very tender; had no sleep; bowels still constipated.

Ordered one grain of Acetate of Morphia.

Nine o'clock A.M.—Mr Goolden and Mr Cheetham reported that she continued to vomit the same fluid; skin warmer; pulse less frequent and countenance less anxious; bowels moved; passed urine; lochial discharge; abdomen tense and sore.

To take one grain of Acetate of Morphia and saline effervescing mixture.

Half-past one o'clock P.M.—Mr Goolden was urgently summoned; it was stated she was dying; he found her very drowsy or lethargic; had great difficulty to rouse her; pulse 140; countenance flushed and rather bluish in colour; no vomiting; abdomen distended.

Two o'clock P.M.—Present—Dr Radford, Mr Goolden, Mr Dunn, and Mr Pigott. She still continues very drowsy; pulse 140 and very tremulous; skin bedewed with a cold prespiration; her countenance is sunken, and her cheeks are of a purplish colour; her breathing very hurried, with mucous râle; does not vomit; belly tympanitic; bowels not moved.

Ordered an enema with Sp. Terebinth., &c.

The symptoms continued to grow worse until seven o'clock *(vespere)*, when she expired, having lived about twenty-seven hours after the operation.

Body examined twenty hours after death, by Mr Dunn and Mr Gaskell, in the presence of Dr Radford, Mr Goolden, Mr Piggott, and Mr H. Winterbottom.

General tumefaction of the abdomen; its parietes being extremely thin. The edges of the external wound were nearly altogether adherent; adhesion of the peritoneal surfaces of the intestines and that of the abdominal parietes. On breaking through these adhesions, about a pint of bloody serum was discharged. The convolutions of the bowels were firmly united, and effused lymph was seen on their surfaces. The colon adhered to the uterus. We were particularly struck by the very remarkable paleness of the tissue of the intestines when compared with their highly injected vascular state seen during the operation. The uterus stood obliquely; the wound in this organ was three and a half inches long; its edges were flabby and gaping; the *os* was very patulous, and its lips ragged and gangrenous. The lower portion of the cervix was very soft and dark coloured. The internal surface of the uterus was softer and darker in colour than usual. The gall bladder large and full; spleen healthy; the left kidney externally natural, its pelvis large, and it contained a creamy coloured fluid; right kidney smaller than usual and contained a similar fluid; the legs very œdematous. Pelvis removed, found an excessive quantity of fat about the pelvis and back.

Pelvis—Brim tripartite in shape.

From upper edge of the 5th lumbar vertebra to the inner surface of the symphysis pubis two six-eighth inches.

From side of the said vertebra to the ilium behind the acetabulum on the left side five-eighth of an inch.

From side of the said vertebra to the ilium behind the acetabulnm on the right side one one-eighth inch.

From the inner surface of the pubes anteriorly, to the acetabulum on the right side three seven-eight inches.

From the inner surface of the pubes anteriorly, to the acetabulum on the left side, three and a-half inches.

Cross measure of the widest portion of the anterior slit five-eighth of an inch.

Cross measure at the point of anterior slit two-eighth of an inch.

Outlet.—From the point of the coccyx to the lower edge of the symphysis pubes two five-eight inches.

From the widest part of the antertor slit to the coccyx one and two-eighth of an inch.

Depth of the anterior slit two inches.

Between the anterior edges of the *tubera ischii* and six-eighth of an inch.

Between the posterior edges of the *tubera ischii* two and a-half inches.

From the right spine of ischium to the coccyx six-eighth of an inch.

From the left spine of ischium to the coccyx five-eighth of an inch.

Depth of the fore part of the pelvis three five-eight inches,
„ lateral part of the pelvis three six-eight „
„ posterior part of pelvis three „

Distance externally between the bottoms of the acetabula one seven-eighth of an inch.

Distance internal measurement one three-eighth of an inch.

Distance between the superior spinous process of the ilia seven and a-half inches.

Distance between the inferior spinous process of the ilia, four seven-eight inches.

Distance between the centre of the crests of the ilia, ten inches.

Distance from the upper edge of the 4th lumbar vertebra to the inf spinous process of right ilium, one six-eighth of an inch.

Distance from the upper edge of 4th lumbar vertebra to the inf spinous process of right ilium, two six-eighths of an inch.

Remarks.—*Mollities ossium*, under which this woman suffered, usu commences during pregnancy, but in her case it most likely begun at time she first complained of pains in the back and hips. The disease n probably made little progress until her second pregnancy, when no do it was much aggravated, but its ravages on the pelvic bones were chi made during her last gestation. Some of her relations had suffered fr rheumatism, and it was said that she had laboured under the same co plaint; but for anything I know to the contrary, they (her relatio might have had the disease now under consideration. The predisposit then (most likely hereditary,) remained comparatively undisturbed, u roused into activity by those changes which are produced on the vascu and absorbent system by impregnation. Her occupation as a weaver doubt greatly contributed to increase the degree of pelvic distortion. T projection of the promontory of the sacrum and lumbar vertebræ mec nically impeded the passage of the fæces into the rectum, which in su cases is always an additional cause of constipation, and which almost in riably occurs, to a greater or less degree, in ordinary pregnancies.

The enema apparatus should have a long flexible tube, (like that whi is passed into the stomach to throw fluids into it,) so that its point can carried beyond the altered pelvic brim. An ordinary female cathete too short to answer its purpose in cases of this sort; it should be equal length to that of the male. By the deflected state of the uterus, the bl der is forced forwards and downwards, whereby its cervix is lengthen and compressed upon the pubes. This altered position of the bladder quires a different method to pass the instrument. The point being int duced into the meatus, (which lies in the upper part of the anterior pel slit, and a little behind the lower part of the *symphysis pubes*,) the ha part must then be depressed and carried backwards towards the extrem of the coccyx, and the instrument must afterwards be cautiously moved into the bladder.

The stethoscope affords us information of two kinds,—positive and gative; in its application here we only derived the latter kind. The p sations of the infant's heart could not be heard, and from the absence its sound, coupled with the odour of the vaginal discharge, we conclu it was dead. The functions of the placenta had long ceased, and theref no *soufflet placentaire* was audible, so as to point out to us the location this organ. If it had been otherwise, I might, and indeed ought, as far possible, to have made the incision into the uterus, so as to avoid cutti on and into the placenta. The importance of such a procedure I stated, before the operation, to Mr Dunn, and requested that he wou as expeditiously as possible, extract the infant, and at the same time one hand to guard its neck from spasmodic seizure by the uterus, if p chance I should unfortunately cut upon the placenta. I have elsewh (*Edin. Med. and Surg. Journ.*, Vol. 60, p. 67,) ventured to state t (the incision and consequent partial separation of the placenta,) as cause of this irregular contraction of the uterus. If the child had b alive, most likely such a grasp would have destroyed it before it co have been extricated.

It is to be lamented that the existence of labour had not been earl known, as perhaps a different termination would have taken place. wait for the changes which usually occur in the *os uteri*, during the fi stage of normal labour, is a great mistake in those cases in which th exists extreme pelvic distortion. This part of the uterus is not often to be felt, and when it is accessible, it is found a little open, its full dilatation having been prevented by the vicious conformation of the brim of the pelvis. The evil arising from this procrastination ought to be a beacon to us in future, and guard us againstvainly waiting for such a change. The highly inflamed state of the bowels which existed before the operation, and their pathologial condition after death, together with that of the *os* and *cervix uteri, &c.*, afford indisputable evidence of the mischief which had been inflicted during her protracted labour.

The term protraction should be relatively considered; a woman (as in this case) in a bad state of health cannot safely endure the same degree of pain, or for the same length of time as one who is well; nor will the *os* and *cervix uteri* bear pressure very long, without structural injury.

Surely there is here sufficient proof of the necessity of the Cæsarean section, for neither the presentation of the infant nor the *os uteri* could be touched. Independently of these circumstances I am bold to assert, the delivery could not have been performed by the perforator and crotchet, even if assisted by the marvellous power of the osteotomist, provided the implements were used by the most experienced and celebrated anti-Cæsareanists. No practitioner, then, however warped his opinions are, will presume to attribute the death of this patient to the operation; but on the contrary, will place the case in the catalogue (already too great) of those in which death has happened in consequence of having too long deferred its performance.

2d *Case of Cæsarean Section.* By Thomas Radford, M.D., F.R.C.P., Edinburgh, &c., &c., &c.—(*Successful.*)

This case has been twice more or less placed before the profession; once partially cited in the London Medical Gazette, vol. 36, page 1506; and afterwards in the first volume, with some inaccuracies in date, of the British Record. The following is understood to the authentic and correct report of the case as given by the author.

At half-past one o'clock A.M., Thursday, November 20th, 1845, I visited Mrs Sankey, Bedford Street, Salford, who was then in labour. I met Mr John Goodman, from whom I learnt that the case was one of extreme distortion of the pelvis, &c. She first felt slight pains about eleven o'clock on Wednesday morning. Sometimes they were stronger, and continued to vary in severity until about three hours before my arrival, during whice time they were uniformly stronger. The membranes ruptured some time in the afternoon, and there was a slight dribbling discharge at intervals up to the time of my first visit. The tongue was clean and moist; her countenance was calm and composed; her bowels had been freely evacuated; and she had regularly passed her urine. She was free from sickness and vomiting. Pulse 84 at first, but temporarily rose to 100.

Placing my hand on the abdomen I found the uterus of a spheroidal shape, but less so than I had observed in former cases; it felt firm and free from pain when I pressed upon it. The relative position of this organ was now much altered; it hung over, and rested on the pubes, and the fundus projected so much forewards as actually to form its anterior surface. Connected with, and in reference to the axis of the vagina, it presented the retort form. By a vaginal examination, I found the outlet of the pelvis considerably diminished by the close approximation of the rami of the ischia and pubes, which, jutting forwards, had nearly destroyed the arch; leaving in its place only a narrow slit, which would barely admit the point of the finger. The tubera of the ischia were so near as scarcely allowed two fingers to lie in the transverse diameter; the antero-posterior diameter was also much shortened by the great incurvation of the coccyx and lower portion of the sacrum. The cavity was diminished by the several bones which unite in each acetabulum being forced inwards, backwards, and upwards. It was difficult to measure the brim; its figure was tripartite. This alteration in shape was produced by the falling down of the promontory of the sacrum and lumbar vertebræ, and by the ischia and pubes being pushed backwards and inwards, and the jutting forwards of the symphysis and rami of the pubes. The antero-posterior diameter was not more than one inch and a half at its widest part on the right side, and in some parts not an inch. The anterior lobe of the opening was not more than would admit the finger edgeways. The vagina was moist, and had only its natural temperature; it was free from swelling. Neither the *os uteri* nor the presentation of the infant could be felt.

On returning to Mr Goodman, I agreed with him that the Cæsarean section was the only means by which delivery could be performed. I suggested the propriety of having the stethoscope applied to notify whether the infant was alive as the mother affirmed, and also to ascertain the location of the placenta. At this stage I also requested that Mr Winterbottom, surgeon, should be invited; a messenger (Mr S.) was dispatched for Mr Winterbottom, who was desired to bring with him a stethoscope. I now remarked on the danger of cutting into and partially separating the placenta during the operation. Auscultation indicated that this organ was attached to the anterior and right lateral portion of the uterus, and corroborated statements made by the patient that the infant was alive. I now raised the *fundus uteri*, and Mr Goodman made an incision from seven to eight inches long, a little to the left of the umbilicus, and divided the integuments, which were extremely thin. A corresponding opening was then made through the uterine tissue, which was about a quarter or one-third of an inch in thickness, just bordering on the edge of the placenta. I now passed my hand and seized one leg of the infant and extracted it, and when it passed to the head, Mr Goodman assisted its escape through the wound, and afterwards expeditiously extracted the placenta entire. The infant, a girl, was alive. There was very little blood indeed lost, and the uterus contracted and lowered itself to its resting place. The intestines and omentum protruded during the operation, but were then restrained and afterwards replaced and retained in their natural position during the time the ligatures were introduced. I swept my finger round the boundary of the uterus and through the wound into its cavity, to ascertain if any portion of the viscera had got into it. The *interrupted suture* was used, and the thin integuments further brought together by straps of adhesive plaster, and over all a bandage just tight enough to give support was applied. There was a calmness and resignation of mind throughout the entire operation which indicated an enduring Christian spirit; no complaint was made, nor murmur heard, and she expressed herself as happily relieved.

The pulse now beat 92. She had a little gulping; the skin felt warm. To have Tinct. Opii, dr. iss. in about one to two hours; pulse 94; slight retching, and a very trifling oozing of blood was seen on the bandage; her lips were naturally red; respiration 26; fresh bandage and a compress applied.

Quarter-past nine o'clock A.M. Tongue clean; countenance natural; respiration 24; about two to three ounces of blood lost. A negative plan recommended. Mist. Acaciæ, oz. iss. ter in die.

Eight o'clock *vespere.*—Pulse reduced from 100 to 90; countenance good; had complained of tightness of the bandage; the belly a little tumefied, but not tender; there is no bleeding. To take Ext. Hyoscyam., gr. x.

November 21st.—Ten o'clock A.M.—Had vomited a sour fluid during the night. Pulse 86. Countenance natural; tongue clean and smooth; skin cool; lochial discharge natural; bowels not moved. Had passed her urine. Ordered an enema as follow:—Spt. Terebinth., oz. ij.; Ol. Ricini, oz. j.; Vitelli. Ov. et Dec. Hord. q. s.

Half-past one o'clock P.M.—Tongue clean; she has vomited a dark coloured thich and sour fluid, which in appearance looks like fæces. Enema has not operated; ordered it to be repeated, and to take barley-water.

Nine o'clock, *vespere.*—Has had no stool; vomiting continues; belly tympanitic. The compress being removed, the site of the lower portion of the abdominal wound was tumid; and on raising the plaster, the wound itself was seen gaping, and a fold or convolution of intestine had protruded through between (in the interstice of) the two ligatures. The bandage and plasters were now entirely removed. An attempt was made to reduce the bowel, and the edges of the wound well adapted, and fresh straps of plaster and a three-tailed bandage applied.

Ordered, at her request, Ol. Ricini, oz. ss.; to be repeated if necessary.

22d.—Nine o'clock A.M.—Had some sleep. Pulse 100. Had vomited the oil, and also some of the same fluid. Tongue clean; bowels less swelled, but slightly sore; there is a considerable bloody serous discharge from the wound; has passed urine; lochial discharge; has had no stool.

To take calomel, gr. v.; a quantity of gruel to be thrown up by the syrange, with the œsophagus tube passed high up towards the sigmoid flexure of the colon.

Seven o'clock, *vespere.*—Has slept several times; pulse 90 to 95; feels better; skin cool; vomiting ceased; belly less swelled and easy; and another enema had been administered, but it procured no stool.

She was ordered to take immediately five grains of calomel, with five grains of white sugar; and every third hour a table spoonfull of a mixture, consisting of six drachms of sulphate of magnesia, two drachms of calcined magnesia, and one drachm of compound tincture of cardamom in three ounces of cinnaman water.

23d.—Ten o'clock A.M.—She had slept; pulse 90; tongue clean; had vomited only once a light-coloured fluid; bowels opened four times; skin warm and perspiring; very slight abdominal uneasiness.

Five o'clock, *vespere.*—Had visited her before, and found her going on well; a considerable serous discharge from the wound; had not vomited; has had three stools; has passed urine; has had several sleeps.

To continue Mist. Acac.

24th.—Ten o'clock A.M.—Pulse 95; tongue clean, but redder in the centre; has very little abdominal pain on pressure; bowels purged two or three times; has passed urine; she says she feels weak.

Continue to take beef-tea.

Half-past seven o'clock, *vespere.*—Pulse 100; tongue clean, but sore; belly less tumefied, and bears preasure; a considerable bloody serous discharge from the wound; had been twice purged, and attended with griping pain.

To continue the medicine, and to take half an ounce of the following mixture if the diarrhœa continues:—One drachm of chalk, one ounce and a-half of gum arabic mixture, one ouuce of distilled water, one drachm of laudanum; and at the hour of rest to take one pill, consisting of half a grain of opium, and some aromatic confection.

25th.—Ten o'clock A.M.—Pulse 94; tongue clean; had slept; lochial discharge natural; had passed urine; bowels not again moved; gentle prespirations; belly easy. Cont. Ordered chicken broth.

Half-past four o'clock P.M.—Pulse 85; symptoms all favourable; has a cough. Taken freely of chicken broth and beef-tea.

To have at hour of rest ten grains of extract of hyoseyamus. To take for the cough when troublesome, one tea-spoonful of the following:—*Mucilage* two ounces, compound tincture of camphor three drachms, syrup of poppies half an ounce.

26th.—Ten o'clock A. M.—Pulse 94; tongue clean; skin a little hotter; bowels unmoved and tympanitic; had passed urine; her countenance a little more anxious. The bandage and plasters were removed. The ligatures were detached from their hold; the integuments expanded to such a degree as to present a large surface of the bowels, which were uniformly covered with lymph. The incised edges were firmly agglutinated to the contiguous parts. Attempts were made to bring the integumental edges nearer together, and the bowels were gently pushed back, and broad straps of adhesive plaster were tightly applied, and a six-tailed bandage, so as to afford firm and equal support.

Sulphate of magnesia, six drachms; calcined magnesia, two drachms in six ounces of water. One ounce every third hour. To have, if requisite, an enema with two ounces of oil of turpentine and two drachms of tincture of assafœtida in five ounces and a-half of water.

Six o'clock, *vespere.*—Pulse 120; skin hotter; has great depression; tongue dry; countenance anxious; bowels unmoved; complains of pain in the belly; has passed water. Ordered the enema to be immediately thrown up. She has just vomited. Cont. An anodyne to be prescribed.

27th. Took one-sixth of a grain of acetate of morphia. Four motions. Slept well. Pulse 60 to 66.

28th.—Pulse 69; has slept well; has had two motions; a considerable discharge from the wound; all the other symptoms better except the cough, which is rather more troublesome. Continue medicine and diet, and isinglass.

29th.—Pulse 84 to 90; slept well; bowels twice naturally moved; all the symptoms more favourable; a considerable discharge on the bandage. Upon removing the bandage and dressings, the wound presented a healthy granulating surface, and was covered with pure pus. There was a small slough at the lower edge. The integuments below, in the bend of the thigh, were irritated and excoriated by the discharge. Continue diet and medicine.

30th.—Pulse 86 to 100; tongue clean and smooth; bowels moved; complains of sore throat, which is red and slightly apthous. Cough very troublesome, and, from its force, produces a sensation of forcing some part through the wound, and, on examination, a portion of bowel was found protruded. The lower part of the bandage and dressing being now removed, it was seen to be not so well; the granulations were paler; the discharge from the left was blackish from the slough. Fresh pledget of lint and plaster applied. Continue the same medicine and diet, and also to have eggs and the following mixture.

Borax, three drachms; syrup of poppies, half an ounce; mucilage, two ounces and a-half. A little occasionally. To take at hour of rest one pill containing one-fourth of a grain of acetate of morphia, and repeat it if necessary.

December 1st.—Pulse 100; all other general symptoms better. A considerable discharge from the sore, which was dark coloured and offensive; a protrusion of the granulated portion of the sore through the dressings, which were now removed. The aspect of the sore pale, its left edge was sloughy in places. The dressings were changed for pledgets of lint with cerate, over which double folds of lint were placed, and a six tailed bandage to support as far as possible. Our object was to form a barrier to further protrusion, as from the intimate adhesions which now existed amongst the convolutions of the bowels themselves, and between them and the integument, it would be mischievous to attempt to do more than o defend and barely support these parts. On the right side, the oldand new surface presented one plane. To take a generous diet and porter, and also the anodyne pill.

December 2d.—All the general symptoms favourable; had first refused to take porter, but afterwards did so; wound looks better; granulations redder; pus laudable; cicatrization on the left side proceeding; sloughy appearance on the right side much better. Continue diet, porter, and night pill. At the evening visit she reported she had taken beefsteak and porter at dinner, and we found her eating the leg of a fowl, and again drinking porter. Cautions given not to get into excess.

3d.—Mr Goodman, at a later visit last night, found her pulse considerably more frequent. She complained of the wound. On examination he discovered that a large loop of intestine had protruded on the left side, which he unsuccessfully attempted to reduce. He placed a pledget of lint with cerate over it. This morning the pulse 120; bowels not moved; she had vomited some undigested animal food. The body linen was very wet by discharge, which had a pungent disagreeable smell. The dressings adhered so firmly that they were with difficulty removed. A loop of intestine, of a horseshoe shape, covered with lymph, was fixed by adhesion; it was very much distended. Cautious but unsuccessful attempts were made to reduce it. I suggested the propriety to pierce it with a needle; a sharp-pointed bistoury was however used, but nothing but a little blood escaped. Another unsuccessful attempt was made to reduce it. Broad slips of plaster and a bandage applied. An enema, with oil, &c., to be thrown up with the syringe and œsophagus tube. To discontinue the porter and animal food; to take chicken broth. Ordered some coriander or mustard seed to be taken, and the anodyne pills.

4th.—Bowels freely moved several times, but the seeds were not seen. All the symptoms better. Continue.

5th.—Bowels three times moved, and in the last motion the coriander seeds were seen: every other general symptom favourable. The wound healthy. The union on the right side complete, and the cicatrization proceeding. On the left side, the loop still lay prominent, and the edges of the sore were everted, and in an unfavourable position for this reparative process. Continue diet and anodyne pills.

6th.—Pulse 95; bowels unmoved, slept well; wound looking healthy, lessening in diameter, cicatrization rapidly praceeding; the surface over the protruded intestinal loop granulating; this portion of bowel immoveably fixed down. Continue medicine; to have an enema and her anodyne pill.

7th.—Pulse 90; bowels twice very freely moved, and in one motion some coriander seeds were found; a profuse irritating discharge through the dressing. On exposing the parts, an opening was found at the lower end of the protruded bowel, through which fæces had passed, and were now escaping; the enema had not been given, but it was now directed to be administered. To continue to take the anodyne.

8th.—Pulse 90; slept well; bowels once opened by the enema; the size of the wound is considerably diminished, and its surface looks healthy; fæces in great abundance were discharged through the intestinal apening; to continue the same plan. Ordered an enema and anodyne pills.

9th.—Pulse 84; bowels opened by enema. The wound is diminished in size, and looks healthy; the fæces are largely discharged through the opening in the bowel. To try to eat some calves' foot. To continue to have an enema and the anodyne.

10th.—Pulse 80 to 84; the wound considerably lessened, and its entire surface looks well; the apparent size of the protruded bowel is greatly diminished, and it is covered with healthy granulations; its horseshoe character is nearly lost; great quantity of feculent matter comes through the opening; portion of undigested calves' foot was observed in the discharge ordered a little wine. Continue diet. To have an enema and pill.

11*th*.—Pulse 74; wound lessened and looks well; bowels moved by enema; fæces in great abundance from the opening. To continue wine, &c.

12*th*.—Pulse 72; had two stools, which were too light in colour; this perhaps depends on the escape of the biliary fluid too soon, as the fæcal discharge by the opening has been all along very deeply tinged, and is still in great quantity; the sore is now considerably lessened, it does not measure more than four inches in length, and two to two and half in breadth; the protruded intestine so far retired as not to be seen, except when the integument is drawn aside; the integumental edges of the sore can now be approximated. To continue the wine, &c.; to have an enema, and to take the pill.

13*th*.—Pulse 74; right edge of the wound was more inverted, which had been produced by approximating the two sides; bowels slightly moved; considerable fæcal discharge from the wound, and in it some coriander seeds were seen which had been taken early in the day; the wound dressed in its longitudinal direction. Continue the wine, &c.; to have an enema; to take the pills.

14*th*.—Pulse 72; has had no motion; granulations paler; the discharge of fæcal matter great through the wound; a sponge compress was applied over the opening, which was to be removed at intervals; it was, however, permanently discontinued in the evening. Continue wine; to have jelly, blancmange, isinglass, and to be allowed a partridge.

15*th*.—Pulse 76; small hard fragment of stool brought away with the enema; countenance more dejected; complains this morning of a load at the stomach, which in the course of the day ended in vomiting of a quantity of undigested animal food; the fæcal discharge great from the wound. As the granulations were exuberant, the sore was dressed with dry lint. Wine increased; continue altera.

16*th*.—Pulse 74; wound less and looks better; bowels not moved. To only have some broth, with a little of the chicken pounded in it. Continue medicine. To have an enema.

20*th*.—No particular change in the aspect of the case up to this date. Pulse now 74. The fæces still largely discharged from the intestinal opening. The protruded portion of bowel very red from the everted mucous membrane. Mr G. passed his little finger, and carried this part in. A compress was applied and supported by plaster.

31*st*.—During this interval the pulse nearly uniformly 72. Bowels some days spontaneously moved once or twice; but nevertheless an enema was daily administered. All the general symptoms continue to improve, and the excoriations produced by the discharge were attended to by washing, &c. The everted mucous membrane of the bowel which appeared through the opening had at first rather increased, but now was considerably less. Compresses or pads were applied, &c. The discharge of fæcal matter through the opening has gradually lessened.

January 10*th*, 1846.—As in the last report, the pulse had uniformly continued steady. The bowels were sometimes moved more than once a-day; the enemas were regularly administered; the everted state of the mucous membrane of the bowel varied in degree and in colour. Her spirits were very low on the 4*th*, in consequence of the very great discharge which took place through the opening in the bowel. The treatment consisted of small pads placed immediately over the aperture, being supported by small slips of adhesive plaster, and then upon the integuments, and over the other a larger pad, &c., fixed by broad straps and bandage.

17*th*.—Since the last report, the pulse continued natural, and she slept well, and her appetite was good. The bowels were naturally opened once or twice a-day, and therefore the enema had been discontinued until the *14th* ult., when the bowels were only partially moved, and as the belle had become more tumid, they were again used; the discharge from thy intestinal opening was at first less solid and more serous, but afterwards it became again more feculent; compresses of different kinds were applied, and one suggested by me, made of layers of caoutchouc, was used, but did not succeed; on this day the fæcal discharge was much greater, which I accounted for by the opening, which was about the size of a fourpenny piece, having changed its relative position with the integuments. I recommended that a conical piece of sponge should be placed with its point inwards, and be supported by plaster and bandage. Mr Goodman feared that it would be injurious to use the sponge, as it might dilate the opening and induce ulceration; my reply was that I did not fear the first effect, and if the second happened, it would only be limited in degree, and advantageous. I thought at this time the edges of the wound were in a favourable position to be pared, and a ligature used to bring them into apposition.

22d.—Pulse kept natural, and the bowels were daily moved twiee; the sponge had become a little swelled, aud the edges of the opening bled a little; it was re-applied on the *20th;* the bandage was very wet, and was attended by a disagreeable ammoniacal smell, which no doubt arose from the docomposition of the discharged fluid which had taken place in consequence of the parts not having been dressed the day before, and the surrounding integuments were considerably irritated and excoriated; at my desire, a simple dressing with lint and cerate was adopted, and a very loose bandage applied. The patient had sat up, but the horizontal position was advised. On this day (*22d,*) the eversion of the mucous membrane was greater, and the opening had slightly increased; a piece of sponge was recommended by me, but a compress of lint was applied at Mr Goodman's desire.

January 23*d.*—Pulse good; bowels twice moved; the integumental excoriation rather extended; the intestinal opening is a little larger. Mr Goodman proposed touching its edges with argent. nitr., but I considered that the surface would heal underneath before the eschar separated, and suggested the *potassa fusa.* Mr G. thought it would be difficult to limit its application, although my opinion was that its action might be controlled, I recommended instead of it the edges of the opening to be pared off, which Mr G. did by a lancet and bistoury. This operation was not so effectually done, in consequence of the tender and fragile state of the part. The edges were approximated and supported by slips of adhesive plaster. The integuments being drawn together formed a covering and compress to the aperture.

31st.—During this interval the pulse was natural, and the bowels some days moved spontaneously, and always responded to the use of an enema. The intestinal opening remained much the same, and the discharge from it, although not equal in amount every day, was yet sometimes very great. Various methods were tried to control it. Pitch plasters in different ways, and compresses, were used, at the suggestion of Mr Goodman, but they invariably failed to do good, on the contrary mischief was done by them. At my request pads made from caoutchouc, of different sizes, and placed differently, were employed, but equally unsuccessfully. I recommended broad straps of plaster from the Infirmary to be tried, which also failed, as considerable irritation and excoriation had been produced by the pitch plaster; indeed the pain and inconvenience sustained by the patient was such, that she not only requested a discontinuance, but strongly protested against its use. My opinion was unfavourable to their use, as I considered disadvantages from them arose, not only on account of the irritation, &c., arising from the pitch itself, but from the mechanical effects by inflecting the integuments upon each other, and also by impeding, by the great pressure produced, the peristaltic motion of the bowels. On the 30th I saw the patient alone, and thought it would be better to apply a simple dressing.

February 1st to 13th.—It appears that a great discharge issued from the opening after the last dressing, so that the nurse, at the desire of Mrs Sankey, had removed them, and brought the edges together by adhesive plaster. Long straps of plaster were again recommended by Mr Goodman, and very tightly applied, some of which were passed round from one side of the spine to the other. Great integumental irritation and excoriation ensued, and it was, therefore, thought desirable not to bind the parts so tightly. The edges of the opening were touched from time to time with the Argent. Nitrat.

2nd.—I suggested the propriety of having a bandage made of some elastic but firm material, so that the diaphragm and abdominal muscles could move in opposite direction, and without the least impediment, and at the same time feel uniform support.

11th.—Mrs Sankey stated that they had removed the quill, as nothing had passed thaough it. Mr Goodman had placed the barrel of a quill as a conductor for the fæcal discharge, but this it appears did not answer, nor was it likely to do so, as it would be quite impossible to place such a body in a parallel direction with the course of the intestinal tube; and we cannot for a moment suppose that it could act by suction.

12th —I found that pitch had been used again in dressing the part the day before; the evils were increased by this plan, the surrounding irritation and excoriation were seen to be much greater. Mr Goodman ordered a new bandage, with gussets for the hips, and buckles and straps were attached to it, so that it could be tightened and fixed. This contrivance proved of great advantage to her. She wore it for a considerable time, and Mr Goodman states he had the satisfaction to find a progressive diminution of the fæcal dsscharge which passed through the intestinal aperture.

Remarks.—Mrs Sankey's occupation was merely domestic. She was a slender, delicate, and spare-looking woman. Her complexion was pale, her skin was swarthy, her eyes were gray, and she was of a leuco-phlegmatic constitution. She was naturally of a mild and placid disposition, and her mind was placable, and strongly imbued with sound moral and religious principles, which wonderfully supported her in her severe trial, the intensity of which it is scarcely possible for imagination to conceive. What can be more dreadful than the anxieties of a woman in the pangs of labour without hope of delivery? She bore the operation with great fortitude, and scarcely made a moan, and afterwards endured a tedious recovery with great patience and resignation. Her age was 41 years. This was her seventh pregnancy. Her first four labours were natural and easy. In the first she was delivered of a living girl, and in the other three of boys, all born alive. The fifth labour was natural, but it was rather more tedious than her former ones; the infant (a boy) was born alive. At the end of two years she was again in labour of her sixth child, which was protracted by pelvic distortion, and Mr Goodman, with Mr Slack's assistance, delivered her by means of the perforator and crotchet.

The disease (mollities ossium) under which she now suffered no doubt commenced after her fifth labour, which proved a little tedious. It is, however, very probable, that the mischief inflicted on the pelvis was only slight at this period, and during the interval between it and her next pregnancy most likely the disease remained stationary; whilst pregnant of her sixth child it rapidly advanced, and committed great ravages in the pelvis. Her general health suffered, and her strength failed. Her stature became obviously less. Mr Goodman kindly informed me that the thighs omewhat bowed, but afterwards recovered the usual shape. During her abour Mr Goodman found the pelvic diameters shortened, the antero-posterior only measured about two inches. After a consultation with Mr Slack, he delivered her with the perforator and crotchet. It, however, rarely happens, that the disease is so rapid in its progress, and does so much injury to the pelvis as to require these murderous instruments before those which are compatible with the safety of the infant, have been used in a former labour. After her puerperal recovery Mr Goodman judiciously prescribed for her tonics and other appropriate remedies, and recommended her to the seaside for the benefit of bathing. Her health was greatly improved, and perhaps the progress of the mollities osseum was temporarily arrested. This disease again returned, and produced effects on the pelvis during her pregnancy which rendered necessary the Cæsarean section for her delivery. Many circumstances existed in this case which favoured its propitious termination. Her calm and tranquil state of mind, and the high degree of moral courage she had, were very advantageous.

An early rupture of the membranes in protracted labours, especially if the pains are strong is always to be deplored, but most fortunately this did not happen here very long before the performance of the operation. The water was not suddenly and completely discharged at once but dribbled away. The pains were also very feeble until a very short time before my visits. The conjoined effects of these were doubtless favourable, and prevented an injurious pressure on the soft parts. The bowels were freely evacuated during her labour.

By the aid of the stethoscope the incision was made in a direction to avoid cutting into the placenta, which is very important. When the placenta is cut upon or into, partial irregular contraction of the uterus happens, and through such an accident the infants may be lost as I have already stated, but besides this, the tissue of the uterus is likely to suffer from the force required to extricate it (the infant) from the spasmodic grasp of this organ. Besides, there may be a greater risk of hæmorrhage when the placenta is prematurely disruptured or separated. The operation was timely performed in this case. There happened several important contingent circumstances which I shall briefly advert to. The abdominal parietes were so much attenuated as only to allow a very slender hold to be taken by sutures, and were quite unequal to resist the pressure they were subjected to. By the force of the cough, &c., this weak structure was torn through, and the edges being thereby set at liberty, retracted on each side to a considerable extent, and exposed the bowels fully seven to eight inches in one direction, by three to five in the other. Notwithstanding this serious accident the constitutional disturbance was only trifling in degree and of short duration.

The changes which successively took place on the exposed surface of the bowels were truly astonishing. A thin transparent effusion of lymph was first seen laid over the peritoneal coat of the intestines, which entered a little into the depressions formed between their convolutions. This thin gelatinous material gradually became thicker and more opaque, evidently the second step towards cicatrization. During this wonderful process,—for its effects were truly wonderful,—innumerable vessels were seen, destined to carry on this great work of reparation. As this went on there was a progressive and perceptible diminution in the size of the surface; and when completed there was a cicatrix to be seen very little different from one which is formed at the healing of a wound whose edges have been kept in juxtaposition.

Symptoms of strangulation appeared, for the relief of which several expedients were adopted. The protruded portion of the bowel was ineffectually punctured. Nature, however, stepped in, and immediately the symptoms were relieved by the formation of an opening, through which a great quantity of feculent matter and flatus were discharged. This aperture, as is mentioned in the reports, continued throughout the case. Although this disaster protracted the patient's recovery, there is no doubt it had at the time it happened a most salutary effect. During the whole period of the case the bowels were strictly attended to; and there is no doubt their ready obedience to our measures (chiefly enemata) considerably contributed to her recovery.

The reparative process which happened in this case, and the decidedly conservative constitutional power which this woman had, proved beyond dispute that the opinion expressed by Dr West, *London Medical Gazette*, No. 1210, February, 1851, page 245), is not infallibly true; and, therefore, ought not to influence us, and deter us from the performance of the Cæsarean section. The same restorative power was observed in the other successful case, which is already before the profession.

As it was important to preserve the infant, Dr Radford strenuously urged Mr Sankey to obtain a wet nurse; and no time was lost in obtaining one. The infant continued to thrive, and lived rather more than seven months. Her death was occasioned by an hydrocephaloid disease, the consequence of exhaustion from diarrhœa. In a late number of this journal I mentioned that Mrs Sankey again became pregnant, aborted, and afterwards died.

3. *Case of Cæsarian Section.* By H. M. Jeter, M.D. [The *Southern Med. and Surg. Journ.*, March 1851, and *American Journal of Medical Sciences*, No. xlii, April 1851, p. 538.]

On the night of the 4th of December last, Mrs B., aged thirty years, was taken in labour with her sixth child. I was called at 3 o'clock in the morning to attend her accouchement. I found her with weak and irregular pains, and was informed that such had been their character from the commencement of labour at 9 o'clock. Soon after, however, her pains began to increase, and, upon examination *per vaginam*, I found the *os tincæ* well dilated, and the waters collected in large quantity. The back of the fœtus presented; I waited until the mouth of the uterus was more completely dilated, and ruptured the membranes, discharging an immense quantity of water. I proceeded immediately to turn, so far as to bring down the breech, making a breech presentation. The difficulty attending the operation of turning was so great, in consequence of the extraordinary size of the child, (it being very large,) that I regarded it hazardous to attempt to complete the operation, and left it in this situation to the natural efforts of the womb. After about two hours of very hard labour, the breech so far advanced as to enable me to bring down the feet. I essayed by every possible means to assist the efforts of the uterus, by making all the traction upon the inferior extremities of the fœtus that was warrantable, being convinced that the fœtus was dead.

Finding all efforts to make any further advance in its delivery entirely fruitless, I attempted to perforate the cranium, but found it impossible, in consequence of the size of the child, to pass the perforator up to its head. I then eviscerated the fœtus, with the view of passing the instrument up within the cavity of the fœtal thorax to the base of its cranium. This also failed to make room for the operation, without proceeding at random and great consequent hazard ta the mother, as I could not insert the hand to give any certain direction to the instrument, the head still being entirely above the superior strait. Embryotomy was therefore determined upon, and after dissecting away the fœtus up to its axillæ, which required about two hours, the mother all the while suffering the most severe labour, but which at this time had ceased to make any impression upon the child, and which induced me to conclude that the uterus had probably ruptured, I found her rapidly sinking, so much so, indeed, that we did not think that we did not think that she could survive fifteen minutes longer. I determined at once to operate on the Cæsarian section. I gave my patient a stimulant, and, assisted by Dr Reese, proceeded to make an incision along the *linea alba*, six inches in length, cutting down carefully to the peritoneum, upon dividing which, the head of the fœtus presented, showing that my apprehensions were correct in the womb's having ruptured some time previous to the operation. The head of the child was so large, that the incision had to be extended to ten inches in length to admit its passage. The head measured twenty-nine inches and four lines in its longitudinal or occipito-frontal csrcumference, and twenty-eight inches two lines in its perpendicular circumference, being hydrocephalic. The head and remaining portion of the body being removed, the placenta was found also without the uterus within the cavity of the abdomen, and the uterus contracted to about the size of a small cocoa-nut. This being also removed, the cavity of the abdomen was left filled with coagulated blood from the hemorrhage which took place at the time of the rupture of the womb. Having carefully removed the blood as completely as possible, the wound was closed by the interrupted suture and adhesive straps, leaving a space of about two inches at its inferior extremity for the discharge of the fluids that might remain or collect in the cavity of the abdomen.

Stimulants were given, and other applications made, to revive the sinking energies of the patient, which had become almost extinct. Reaction soon took place, and she was cleansed and placed in as comfortable a position as the circumstances would admit. The vital energies having been sufficiently resusciated, opiates were given freely. She was kept quiet, and rested comfortably during the night and the following day, until about 9 o'clock on the succeeding night, (the 6th), when she was taken with violent vomiting, which continued, with intermissions of not more than half an hour, until 10 o'clock the next day, at which time I arrived, having been called off the evening before, and could not return sooner.

We succeeded in soon checking the vomiting, and she rested easy, with occasional return of the vomiting during the day and following night.

Dec. 8th. Patient complains of some soreness about the womb, and over the abdomen generally, which is considerably swollen; pulse 132, and very restless. Administered a clyster, which produced two evacuations; gave her to drink small quantities of cream of tartar and lemonade.

9th. Patient complains of great soreness and tenderness of the abdomen, which is greatly swollen; tongue dry and red, and great thirst; pulse 140, quick and hard; lochial discharges ceased. Put her upon a treatment of calomel and opium; gave injecttons of warm milk and water *per vaginam*, and applied flannel, wet with spts. turpentine, to the abdomen.

10th. Soreness and tenderness not so great; discharges from the wound in the abdomen free; lochial discharges also free; pulse 136. Gave clyster, which produced one evacuation.

11th. Soreness and swelling still subsiding; pulse 130, more soft and full; lochial discharges, and those from the wound in the abdomen continue freely. Gave small quautities of Dover's powder.

12th. Had one copious alvine discharge during the night, of natural consistence—says she feels much relieved since. The discharges all continue free; pulse 130; wound healing kindly. From this time, nothing of importance occurred to require noting. She continued to improve, and by the 18th day after the operation the wound was entirely healed.

I visited her yesterday for the last time, which was the 29th day since the operation, and found her sitting up by the fire, directing the domestic affairs of her family. Mrs B. is a woman of apparently very feeble constitution, and had been confined to her bed, for two months previous to her labour, with general anasarca of the whole system.

Resolutions unanimously adopted by the Royal College of Physicians of Edinburgh, regarding Practitioners of Homœpathy.

At Edinburgh, and within the College Hall there, the 9th day of May

1851, an extraordinary meeting of the Royal College was held, pursuant to a resolution agreed to at the last quarterly meeting, and of which extraordinary meeting due notice was given.

The PRESIDENT in the chair.

The following resolutions were moved, seconded, and unanimously agreed to:—

1. That the Royal College of physicians of Edinburgh did, several years ago, publicly express its opinion of homoeopathy and homoeopathic practitioners, by peremptorily declining to admit into its body a candidate for its fellowship who belonged to that denomination; and, consequently, that no Fellow of the college can possibly be ignorant of the light in which all those who practise homoeopathy are regarded by the college.

2. The College regrets that, notwithstanding this decided expression of its opinion, more than one of its fellows, after being admitted in a different character, have endangered the reputation of the college by becoming homoeopathic practitioners; and the College expresses an earnest hope that [illegible] they have thus virtually separated themselves from the [illegible] sever their further connection with an [illegible] them, and from which they can derive, as [illegible] nothing else than a false position and a spurious [illegible].

3. The College feels the more bound thus to express its opinion, [illegible] have become homoeopathists, and any other [illegible] homoeopathy, must necessarily be aliens to [illegible] profession at large; inasmuch as no Fellow [illegible] can, by any possibility, without [illegible] and from the honour of the profession, [illegible] consultation, or co-operate with [illegible] professional life.

4. [illegible] thought it expedient hitherto to [illegible] Fellows who have become [illegible] subsequently to their admission to the College, [illegible] dealing summarily with those who [illegible] of a physician, it reserves its [illegible] shall be so advised.

[illegible] authority of the College,

J. Y. SIMPSON, *President*.

[illegible] the death of HENRY [illegible] General of Army Hos- [illegible]

[illegible] Contributor to this [illegible] most extensive and [illegible] with Military Medi- [illegible] instrumental in improving [illegible]

[illegible]

THE

EDINBURGH

MEDICAL AND SURGICAL JOURNAL.

1st OCTOBER 1851.

PART I.

ORIGINAL COMMUNICATIONS.

Art. I.—*Contributions to the Military Medical Statistics of the Bombay Presidency.* By John Kinnis, M.D., Deputy Inspector General of Her Majesty's Hospitals.

Part IV.—*On the Health of the Queen's Troops serving in the Presidency of Bombay, from 1st April* 1849 *to* 31*st March* 1850.

Changes of Stations, average Strength, and comparative Health of different Corps.—Her Majesty's 10th Hussars have remained at Kirkee, the 8th (King's) regiment at Kurrachee and Hydrabad, in Scinde, and the 86th at Deesa, the whole year. The 64th and 83d arrived from Ireland betwixt the 4th May and 14th July to relieve the 22d and first battalion of the 60th Rifles, which were transferred to the Bengal Presidency on the 1st November. The right wing of the 22d moved from Poona, first to Colaba, then to Kurrachee, to join the left, before proceeding to Bengal. The 64th and 83d went to Poona on their first arrival, and the 83d remained there at the end of the military year; but on the 24th–27th November, the 64th was moved in divisions to

Panwell to embark for Kurrachee, where they first arrived on the 6th December. The 78th Highlanders, relieved by a European regiment of the Company's service, marched from Belgaum for Vingorla on the 6th and 7th November, and embarked the head quarters or left wing for Aden, the right wing for Colaba.

Of the	10th Hussars, Kirkee.	8th Regt., Kurrachee & Hydrabad.	22d Regt., Colaba and Kurrachee.	60th Regt., Peshavar & Kurrachee.	64th Regt. at sea, Poona, and Kurrachee.	78th Regt., Belgaum, Colaba, and Aden.	83d Regt. at sea and Poona.	86th Regiment, Deesa.	Total.
The aver. annual strength was	675	1069	665	592	1060	1073	1169	1145	7448
Average daily sick,........	66	82	66	97	63	49	53	69	545
... *i. e.* per 1000, ..	98	76	99	164	59	46	45	60	91
Sick, 1st April 1849, ...	76	97	106	58	20	84	45	63	549
Admissions,...........	1556	2024	1566	1996	2161	1538	1466	1848	14155
... *i. e.* per 1000,......	2305	1890	2355	3523	2038	1433	1254	1614	1900
Deaths in hospital,..............	19	34	40	36	76	31	62	27	325
i.e. p. 1000 of strength, ...	28	32	60	61	72	29	53	23	44
i.e. p. 1000 of admissions,	12	16	25	18	35	20	42	14	23
Invalids, ...	18	48	38	13	4	33	3	19	176
... *i. e.* per 1000, ...	27	45	86	22	4	31	3	17	23
Sick, 31st March 1850,...... ...	57	63	...	1	37	71	49	59	336
Deaths out of hospital, ...	...	4	1	1	4	2	1	4	16

In different corps, then the

Daily sick,.........	varied from	45 to 164	per 1000 of the strength.
Total admissions,		125 to 3523	
Total deaths,......		23 to 72	
Number invalided,		3 to 57	

And in order

of Sickliness,		of Mortality,	
The 60th Regiment was	1st	The 64th Regiment was	1st
... 22d ...	2d	... 60th ...	2d
... 64th ...	3d	... 22d ...	3d
... 10th Hussars,	4th	... 83d ...	4th
... 8th Regiment,	5th	... 8th ..	5th
... 86th ...	6th	... 10th Hussars,	6th
... 78th ...	7th	... 78th Regiment,	7th
... 83d ...	8th	... 86th ...	8th

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* 80 remained under treatment in the 22d and 183 in the 60th, when these corps were transferred to the Bengal Presidency, 31st October 1849.

The preceding table shews the comparative health of whole regiments dispersed, as the component parts of some were over distant parts of the command. The following exhibits the comparative salubrity of different stations.

Divisions.	Stations.	Corps.	Period at Stations.	Average strength for the period.	Annual average strength.	Admissions.	Deaths.	Rates per 1000 of Admission to strength.	Rates per 1000 of Deaths to strength.	Rates per 1000 of Deaths to Admiss.
Presidency,	Colaba,	22d R. wing,	1st April to 31st Oct.	586	342	1108	30	3240	88	27
		78th do.	6th and 7th Nov. to 31st March.	547	228	485	10	2128	44	21
		Queen's Depot,	...	..	16	25	2	1560	125	80
		Total duty men,	...	...	586	1618	42	2761	72	26
		Invalids, ...	...	..	38	97	11	2553	289	113
		Total, ...	..	...	624	1715	53	2748	85	31
Poona,...	Poona,	64th Regt.,	18th May to 23d Nov....	1078	552	1444	45	2616	81	31
		83d do.	6th June to 31st March,	1170	960	1228	56	1279	58	46
		Poona station,.. ...		...	1512	2672	101	1767	67	38
	Kirkee,	10th Hussars, ...		...	671	1545	18	2303	27	12
		Poona division, ...		...	2183	4217	119	1932	55	28
Southern,	Belgaum,	78th Regt.,	1st April to 5th Nov.	1073	631	809	16	1282	25	20
Northern,	Deesa,......	86th do.	....	...	1145	1817	26	1518	22	14
Scinde,	Kurrachee,	8th rt. wing,	....	...	579	786	16	1318	28	20
		22d left wg.,	1st April to 31st Oct., ..	507	296	451	9	1524	30	20
		60th depôt,	1st to 31st,	150	87	146	6	1655	69	41
		64th Regt.,	24th - 27th Nov. to 31st March, ...	1054	362	637	26	1740	72	41
		Total, ...		...	1324	2010	57	1520	43	28
	Hydrabad,	8th left wing, ...		...	489	1214	16	2483	33	13
		Total Scinde, ...		..	1813	3224	73	1794	46	23

Divisions.	Stations.	Corps.	Period at stations.	Average strength for the period.	Average annual strength.	Admissions.	Deaths	Rates per 1000 of Admission to strength.	Rates per 1000 of Deaths to strength.	Rates per 1000 of Deaths to admi
	Peshawar,	60th, 1st battalion.	1st April to 31st Oct.	849	495	1851	29	3739	58	16
	Aden,	78th left wing.	6th-7th Nov. to 31st Mar.	498	208	222	2	1067	10	9
Passage from Cork.		64th Regt.	1st April to 4th May & 2d June (as 47 d.)	1108	140	73	2	521	14	27
		83d do.	1st April to 8th May & 1st July (as 67 d.)	1147	209	227	5	1085	24	22
		Total, ...		...	349	300	7	839	20	23
		Grand Total, ...		...	7448	14155	325	1899	44	23

By these and similar calculations made in Bombay during my service there, it appears that of every thousand men of the Queen's troops serving in

	In 1847-48.		In 1848-49.		In 1849-50.	
	Were admitted.	Died.	Admtd.	Died.	Admtd.	Died.
The Command,......................	1747	22	1748	26	1899	44
Presidency Division of Colaba,	1780	31	1978	53	2748	85
8th Regiment, ...	1526	10	1535	35		
22d „			2179	68	3240	88
28th „	1442	16				
78th „					2128	44
86th „	1996	84				
Queen's Depot, duty men,*			2666		1560	125
Poona Division, ...	2112	19	2154	19	1932	55
Kirkee, 10th Hussars, ...	2342	25	2282	13	2303	27
Poona Station, ...	2041	172	2066	23	1762	67
8th Regiment,...............	2136	12	2733	21		
22d „	1999	243	1784	24		
64th „					2616	81
83d „					1279	58
86th „	1837	132				
Southern division,						
Belgaum, 78th Regiment,	1770	127	1508	16	1282	25
Northern division,						
Deesa, 86th	1278	209	1510	26	1517	22
Deesa, 28th	1170	178				
Scinde, ...	1195	238	1613	26	1794	40
Kurrachee, ...	1195	238	1590	28	1520	43
8th Regiment, ...			1659	18	1358	28

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* The invalids admitted at Colaba are left out of this comparison.

	In 1847-48.		In 1848-49.		In 1849-50.	
	Were admitted.	Died.	Admtd.	Died.	Admtd.	Died.
22d Regiment			2530	60	1524	30
60th „	1195	238	1336	31	1678	61
64th „					1740	72
Hydrabad, 8th „			2364	15	2483	33
Peshawar, 60th „			1344	23	3739	58
Aden, 78th „					1067	10
At sea, 64th „					521	14
At sea, 83d „					1085	24

Retrospective Health of Corps, 10*th Hussars.*—The 10th Hussars arrived from England in August 1846, and has been always stationed at Kirkee. Its average proportion of admissions has exceeded that for the whole command by 695 per 1000 of the strength the first year, by 534 the second, and 402 the third, while its mortality in hospital has been smaller by two and a-half per cent. the first year, one and one-third the second, two and seven-tenths the third; that of the whole command being only two and one fifth the first, two and six-tenths the second, four and seven-tenths the last year.

8th and 22d Regiments—The 8th regiment continues divided betwixt Kurrachee and Hydrabad. At Kurrachee last year the admissions in the right wing were 1659,and the deaths nineteen per 1000; this year the admissions were only 1358, but the deaths, twenty-eight per 1000, or two and three-fourths per cent.; while the left wing at Hydrabad since February 1849 admitted per 1000 this year 2483, and lost thirty-three. During the seven months ending 31st October, the right wing of the 22d at Colaba, admitted 1108, and lost thirty men, from a strength of 586, being equivalent to 3240 admissions, and eighty-eight deaths per 1000 annually. Last year at Colaba, the left wing, from 2d October to 23d January, and the right, in succession, from 24th January to 31st March, admitted together 608, and lost nineteen men; the strength of the left wing being 501, and of the right 669. The annual average strength of both wings was 279, and the annual ratio of admissions to strength 2179, and of deaths to strength sixty-eight per 1000. At Kurrachee, from 1st April to 31st October, the left wing admitted 4510, and lost nine from a strength of 507 men, being an annual rate per 1000 of 1524 admissions and thirty deaths.

60*th Rifles.*—The mortality of the 60th Rifles last year at Kurrachee, 1st April to 6th October, en route to, and on service in the Punjaub 7th October to 31st March, including a detachment of 88 men left behind at Kurrachee, was 32 in hospital, 10 in action, and 2 from accidents—44 in all. This year at Peshawar, 848 strong, from 1st April to 31st October, the head quarters admitted 1851, and lost 29 men; being at the annual rate of 3739 admissions and 58 deaths per 1000; while the depôt at Kurrachee, 150 strong, admitted 147, and lost 6—*i. e.* at the annual rate per thousand of 1678 admissions and 61 deaths.

64th.—The 64th regiment embarked at the Cove of Cork in divisions, betwixt the 6th January and 9th February, in me charge of the surgeon, his three assistants, and assistant sur Innis, of the 83d, who had also a party of his own corps in ch The first division reached Bombay on the 4th May, the la the 3d June; the strength of non-commissioned officers and was 1109. Four men died during the voyage from *ph pulmonalis*, erysipelas, fever, and cholera morbus, and a fifth drowned. Unfavourable winds and the detection of me among the children embarked detained the different vesse harbour from 5 to 13 days. This detention included, the lo passage was 141, the shortest 106, the average 121 days. average number of days at sea, from 1st April was 47, an the Presidency 318. Catarrh, fevers, and measles among children gave some trouble; but the men were very heal though since their arrival they have had the misfortune to lo from coup de soleil in marching to Poona; 45 men at Po where they remained till the 24th and 27th of November; 2 Kurrachee; and 3 at the Queen's Depôt Colaba, making 7 all. During the year 31 of these fell victims to cholera mor one (as already mentioned) at sea, 15 at Poona, and 1 Kurrachee.

78th Regt.—The 78th regiment marched from Belgaum on 6th and 7th November, to embark at Vingorla, the left, or quarter wing, for Aden, the right for Colaba. Since these

					Ratio per 1000.		
Have been	The strength.	Annual average strength.	Admissions.	Deaths.	Admissions to strength.	Deaths to strength.	De to mis
At Colaba	547	228	485	10	2228	44	2
Aden	498	208	222	2	1067	10	

83d.—The 83d embarked, 1143 strong, at Cove in 7 ve betwixt the 10th February and 15th March. The first div arrived in Bombay on the 18th May, and the last on the 14th In addition to the four medical officers of the regiment, Assis Surgeon Heffernan of the 60th rifles and two ship surgeons in charge of the divisions. During the voyage, 3 men died phthisis, 2 from bronchitis, and 2 from accidental injuries; on the march from Panwell to Poona, 3 from coup de s The longest passage was 119, the shortest 97, the average days. The average number of days at sea from 1st April, mencing the military year, was 67, leaving 268 for the comm At sea from 1st April to the date of arrival, 227 men were mitted, and 5 died. There were 2 cases of phthisis, 1 bronchitis, 36 of acute and 5 chronic catarrh, 20 continued 16 ophthalmia, 12 bowel complaints, 18 cases of primary gonorrhœa, and bubo, and 13 of consecutive syphilis. O fatal cases, 2 of bronchitis and one of phthisis had been admitted before 1st April. At and on the march to Poona, the 83d have admitted only 1228, but lost 56 men: of this large proportion, 22 at Poona were from cholera.

86*th.*—The 86th at Deesa has lost only 26 out of 1145 men, or two one-fifth per cent. during the year. Its proportion of admissions too is nearly one-third below the average.

Salubrity of different Months and Quarters of the Year.—The salubrity of the different months and quarters is in this table compared.

				Ratio per 1000 in the different months to the whole	
Quarters.	Months.	Admitted.	Died.	Admissions.	Deaths.
1st	April	1105	20	78	61
	May,	1156	20	82	61
	June,	1721	36	122	111
	Total,	3982	76	282	233
2d.	July,	1423	38	109	101
	August,	1366	53	97	163
	September,	1431	58	101	175
	Total,	4223	144	298	439
3d.	October,	1726	28	120	86
	November,	1007	15	72	46
	December,	946	31	66	98
	Total,	3679	74	258	230
4th.	January,	846	15	60	46
	February,	697	5	48	15
	March,	728	11	52	36
	Total,	2271	31	160	98
Grand Total,		14155	325		
Monthly Average,		1179	27¼		

				Ratio per 1000 of		
	The Strength.	Admissions.	Deaths.	Admissions to Strength.	Deaths to Strength.	Deaths to admissions.
Was last year	6295	11006	165	1748	25	15
This year	7452	14155	325	1899	44	19
Difference	1157	3149	160	151	19	4

Here in Sickliness		In Mortality	
June stands	1st.	September	1st.
October	2d.	August	2d.
September	3d.	June	3d.
July	4th.	July	4th
August	5th.	December	5th.
May	6th.	October	6th.
April	7th.	April May	7th
November	8th.		
December	9th.	November January	8th.
January	10th.		
March	11th.	March	9th.
February	12th.	February	10th.

Prevalence and Mortality of different classes of Diseases.—14155 admissions during the year were returned under,

			i. e. per 1000 of the whole admissions.	And died.	i. e. 1000 c wh dea
Fevers,		4683	330	47	1
Eruptive fevers,		11	·78	2	
Cholera morbus,		110	7·8	62	2
Diseases of	Stomach & bowels,	2667	188	86	2
	Liver,	674	40·7	40	1
	Lungs,	550	89	4	1
	Brain,	172	12	33	101
Dropsies,		14	·99	4	
Rheumatism,		763	54	1	
Venereal,		1796	126	4	
Ulcers and abscesses,		836	59	3	8
Wounds and injuries,		520	37	. .	.
Punitis,		12	·85	...	.
Morbi oculorum,		572	40	...	.
„ cutis,		68	4·8	...	.
Other diseases,		712	50	9	.
Total,		14155		325	

Predominance of fevers at every station.—The extent to wh fevers have prevailed during the year is shown in this table:—

	For Fevers			The ratio per ratio.		
	From an average strength.	Were admitted.	Died.	Admissions to strength.	Deaths to strength.	Death adr sic
At Colaba	586	561	3	957	5·12	5·
Poona	1512	796	16	527	10·5	2

	From an average strength.	For Fevers Were admitted.	Died.	The ratio per 1000 Admissions to strength.	Deaths to strength.	Dths. to admissions.
Kirkee	671	439	5	639	7·35	11
Belgaum	631	92	...	146	...	...
Deesa	1145	451	5	392	4·3	19
Kurrachee	1324	433	7	327	5·2	16
Hydrabad	489	468	2	957	4·1	4·2
Peshawar	495	1361	8	2477	16	6
Aden	208	40	...	192	...	...
At sea 64	106	6	...	56	..	...
At sea 83	209	20	...	95	...	...
Duty men	7410	4661	46	899	6	7
Invalids	38	16	1	...	...	...
Totals,	7448	4683	47	900	6·3	6·3

This gives an average of 900 cases of fever during the year for every thousand men in the Queen's troops. At Peshawar 1361 cases were admitted from a strength of 848 men in 7 months. This strength is equivalent to 496 for twelve months, and gives the enormous annual proportion in the table.

The proportion of admissions per 1000 of the strength exceeds that of the preceding year by

217 in the command,	361 at Kirkee
2018 at Peshawar,	223 at Hydrabad
377 at Colaba,	22 at Kurrachee

and falls short of it by

149 at Poona,	21 at Deesa
27 at Belgaum.	

The proportion of fatal cases to the admissions exceeds that of last year at Poona 17·4, Deesa 10·5, Kurrachee 22·5 per 1000; and falls short of it in the whole command by 7·75—at Colaba 13·8, at Hydrabad 16·8, and at Peshawar 16.

Here are the admissions and deaths from different types of fever at every station in every corps—

Stations.	Regiments.	Intermitts. Admitt.	Died.	Remittent. Admitt.	Died.	Continued. Admitt.	Died.	Totals. Admitt.	Died.
Colaba......	22d Regt.	21	...	1	1	453	2	475	3
„	78th „	12	...	66	...	8	...	86	...
„	Totals	33	...	67	1	461	2	561	3
Belgaum...	78th Regt.	56	...	2	...	34	...	92	...
Kirkee	10th Hussars	89	...	14	1	336	4	437	5
Poona	64th Regt.	39	...	340	5	110	6	489	11
	83d „	12	...	12	4	283	1	307	5
	Total	51	...	352	9	393	7	796	16

[illegible]	[illegible]	[illegible]		[illegible]		[illegible]		[illegible]	
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] Regt.	—	—	[illegible]	[illegible]	[illegible]	—	[illegible]	[illegible]
[illegible]	[illegible] Regt.	[illegible]	—	[illegible]	—	[illegible]	—	[illegible]	—
	[illegible]	[illegible]	—	1	—	[illegible]	—	[illegible]	[illegible]
	[illegible]	—	—	—	—	—	—	[illegible]	[illegible]
	[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	—	[illegible]	[illegible]
	Total	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] Regt.	[illegible]	—	[illegible]	[illegible]	[illegible]	—	[illegible]	[illegible]
[illegible]	[illegible] Regt.	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] Regt.	[illegible]	—	—	—	[illegible]	—	[illegible]	—
[illegible]	[illegible] Regt.	[illegible]	—	[illegible]	—	[illegible]	—	[illegible]	—
	[illegible]	—	—	—	—	[illegible]	—	[illegible]	—
	Total	[illegible]	—	[illegible]	—	[illegible]	—	[illegible]	—
[illegible]		[illegible]	—	[illegible]	[illegible]	[illegible]	—	[illegible]	[illegible]
	Grand total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Fevers at Kirkee.—At Kirkee fevers were very prevalent during the suspension of and after the monsoon rains, when a marked [illegible] appeared in [illegible] other diseases, as well as fevers, a [illegible] character. Of [illegible] fatal cases, 5 occurred between the 9th August and [illegible] September; five from cholera, 2 from dysentery, and 1 fever; 3 more from between [illegible] November and 15th December; a fourth in an invalid who had contracted fever from drinking spirits [illegible] and exposure to the sun in marching to Panwell. During several weeks the average admissions for fever at Kirkee were 5 daily. Fevers were very prevalent, but less intense after the cessation than during the intermission of the rains. They were generally accompanied by determination to the head, and often to the spleen and other internal organs.

Kurrachee.—A proportion equal to one-third of the strength was admitted for fever.

Of 433 cases of fever at Kurrachee were in the

	Intermittent.		Remittent.		Continued.		Total.	
	Admit.	Died.	Admit.	Died.	Admit.	Died.	Admit.	Died.
8th R. Wing,	10	0	4	0	91	0	105	0
22d L. Wing,	50	0	6	0	42	1	98	1
60th Depot,	17	0	0	0	17	1	34	1
64th Regt.,	52	0	142	5	2	0	196	5
Total,	129	0	152	5	152	2	433	7

8th Regiment.—The 8th regiment did not lose one case of continued fever out of 132 at Hydrabad, 91 at Kurrachee, and 2 at Colaba. Two, in 13 cases of remittent, died at Hydrabad.

Of 26 cases of that type, comprising all that had been treated in the 8th regiment since 1846, and of which one was a relapse, five have died. Of 1846 cases of continued fever, treated during the same period, one in $149\frac{5}{9}$ or ·51 per cent. died.

60th at Peshawar.—The 60th Rifle Regiment admitted at Peshawar in seven months, and from a strength of 848 men, 1361 cases of fever, eight of them terminating fatally. This regiment, at the beginning of the military year, was encamped on the plain of Jamrood, opposite the Kyber Pass. On the 6th May the Bombay force broke up its camp and marched to the places selected for the different regiments in and near the town of Peshawar, to remain during the hot season. The 60th were obliged to encamp again, near the town, in a recently cropped field, until the quarter assigned them was ready for occupation. This was a house and several buildings about half a mile to the southward of the town, which had belonged to and been occupied by Sultan Mahomed, and his people, built in a place or garden called Wuzeerabagh, comprising about twenty acres, enclosed with high mud walls, surrounded by extensive and thickly wooded orchards. The town itself is very large and irregular, with mud walls all round, and is said to contain now about 50,000 inhabitants, though forty years ago the number was double. The filth of every description accumulated outside the walls in the neighbourhood of each gateway is very great, and the effluvia most overpowering, particularly in the hot weather. The graveyards, too, are very numerous, and in every direction round. They are quite open receptacles for filth, and the haunt of jackals and pariah dogs. On the north side of the town the ground is very low and swampy, and most of it cultivated to the bank of the river Cabul, distant about ten miles. Eastward the ground is also very low, and about half a mile from the town there is a large waste marsh. Beyond this the ground rises again, and is extensively cultivated. On the south side the ground is higher, and here is the belt of orchards, from half a mile to a mile in breadth. The other side, which is a broad flat ridge, is cultivated for grain almost to the foot of the Cabul Hills, distant about sixteen miles. Westward of the town the ground gradually rises, until terminated by the Kyber range of mountains, distant about twenty miles.

The cultivation extends to about six or eight miles from the town. The whole of the cultivation is carried on by irrigation, the water for which is brought by numerous channels from two mountain streams. As the supply of water is unfailing, the ground is kept saturated as much as wished by the farmer, and he has two crops a year from it, the first of wheat, oats, barley, and rice, reaped in May, the second of cotton, maize, and some small grains reaped in October and November. In some places, as many as four crops of different kinds are annually obtained from the soil.

From the quantity of marshy ground, and the constant irrigation of the country, particularly of the orchards, intermittent fevers, as might be expected, are very prevalent, chiefly in the autumn, and the troops in exposed situations suffered accordingly. On the north side of the town, the reserve companies of the Bengal Artillery, upwards of 200 men, were quartered in the Fort, at the foot of which the swampy ground commences, and only one man out of the whole number escaped intermittent fever. In almost all the disease was most severe, one-half of the men having organic disease consequent on it.

Eastward of the town, the 31st native infantry were quartered, and the greater number of the seapoys were attacked with the disease in October. On the southward, surrounded by orchards, were the 60th Rifles, and by the end of October upwards of 480 men out of a strength of 800 had been attacked with intermittents. Westward of the town, where the ground was higher and more free from cultivation and moisture, the troops mostly escaped, though many individuals who had suffered from the disease before had here a return of it.

The natives of the place are very subject to this disease, and many of them have disease of the spleen. Ophthalmia also appears to be of frequent occurrence, and the number of people met with who have lost eyes is very remarkable. In the latter end of March and during April thunder storms with heavy showers of rain occurred every six or seven days, keeping down the temperature, which seldom rose above 80° in tents. In the dry clear days, which were general towards the end of April and beginning of May, with a powerful sun, electricity accumulated in objects to an extraordinary degree. On brushing the hand on a towel along the wall or roof of the tents in the evening, a broad streak of light was produced from the number of sparks elicited.

The hot season fairly commenced on the 7th May. Some hot days had occurred in the beginning of the month and end of April, but rain had fallen and again cooled the air. The rest of the month of May from the 7th was excessively hot with frequent, almost daily, hot, dry, parching winds from the north-west, commencing at any hour either of day or night, and blowing strong for hours. The thermometer in tents rose to 115 and upwards, frequently to 100 during the night. Similar weather continued up to the middle of June, after which the hot winds seldom occurred, the weather clear and nearly calm, the heat from the powerful sun very great, the ground, wall, &c., becoming heated like a furnace. July was very similar; but twice or three times at intervals thunder storms occurred with showers which cooled the atmosphere for a few days at each time. In the beginning of August, the air had become loaded with moisture, the heat continuing great and very oppressive till the 14th of the month, when a thunder storm and rain for two days came on and put an end to it. The end of the month and part of September were hot again in the day-time, but not oppressive, and the nights were comparatively cool and continued increasingly so. Throughout October the sun was powerful in the day-time, the nights very cold, the alternations of temperature being 45° and even 50°.

The supply of water for all purposes is abundant and very good. The natives consider that from the streams more wholesome; but to obtain it clear and pure, it is necessary to send some distance. Wells are also numerous, and the water sweet and good. Two of them are famed for the coldness and goodness of the water. One of these was in the Wuzeerabagh, the quarters of the 60th rifles. It was sunk to the depth of 75 feet, and afforded an abundant supply for every purpose to the whole regiment of excellent water, and at the temperature of only 55° throughout the whole season. It was the greatest luxury to every one, and of most essential benefit in the hospital. For the whole of these details I am indebted to the reports, official and private, of my esteemed friend Dr Boyes, surgeon of H. M. 60th rifle regiment.

Poona.—64th and 83d Regiments.—Of 796 cases of fever at Poona in the

	Admit.	Died.	Admit.	Died.	Admit.	Died.	Admit.	Died.
	Intermittens.		Remittens.		Continued.		Total.	
64th,	39	0	340	5	110	6	489	11
83d,	12	0	12	4	283	1	307	5
	51	0	352	9	393	7	796	16

Kurrachee, 64*th Regiment.*—At Kurrachee the 64th admitted for intermittent 52, remittent 142, continued 2, and lost 5. At Poona, in this corps, fevers increased from August to November, when the undrained surface on which the Ghorpoorie barracks stand is loaded with stagnant water, and the atmosphere with emanations from it. In the young and vigorous the more severe forms of the disease and relapses were very common. Eleven cases in the 64th, 5 under remittent, 6 under continued fever, and 5 in the 83d terminated fatally.

78*th Regiment, Colaba.*—In the 78th at Colaba, intermittent appeared chiefly during the dry easterly winds of January. The most severe cases of remittent occurred after the march from Belgaum in November. They were of highly inflammatory character, and ascribed chiefly to solar influence. In the progress of the month they became less inflammatory, and required less active treatment. In January and March they were complicated with hepatitis, and in February, as the sun became more powerful, hepatic congestion.

Cholera Morbus in 64*th Regiment.*—One hundred and ten cases of cholera morbus, 63 of them fatal, have occurred among Queen's troops during the year. Two men of the 64th Re ment were attacked with the symptoms of this disease in the sl "Tulloch Castle," on the 21st and 23d April, in lat. 36° 54′ long. 37° 30′ E., about a fortnight to the east of the Cape Good Hope, and one of them died. The two first among Queen's troops in the Presidency occurred in July at Khandalla two men of the 83d regiment, marching from Panwell to Poo on their arrival in the command. They both recovered, but reported to have been very severe. The next cases occurred Kirkee in the 10th Hussars, two on the 9th, one on the 12 one on the 14th August, and one on the 15th September, fatal. On the 20th August a case occurred in Her Majesty's 8 Regiment, occupying the left flank barracks at Poona, twelve m betwixt 21st and 30th August, ten from 9th to 15th Septemb two on the 19th, and one on the 22d, in all in the 83d Re ment at Poona 26, of which 22 terminated fatally. There h been since two cases, which did well, making the total 30; 13 the number, not including the first case, were attacked in hospi while under treatment for other complaints. On the 7th Septe ber a case appeared in the 64th Regiment, quartered in the ri flank or Ghorpoorie barracks, Poona, three on the 8th, 29 fr the 11th to the 21st, and one on the 26th, making 34 in all fr 7th to 26th September, of whom 14 died. Three women the 10th Hussars, one of the 83d; three women (out of f attacked), and three children of the 64th (out of four attack also died.

64th Regiment.—The 64th regiment left Poona en route Kurrachee in four divisions, on the 24th, 25th, 26th, and 2 November, embarked at Panwell on the 1st and 2d, and reach its destination on the 5th, 6th, and 8th December. One case cholera, severe but not fatal, occurred in the first division two d before it reached Panwell. The same day a middle aged pa lytic woman, and on the 3d December, in the steamer, an ag female was attacked and died. Betwixt the 7th and 29th I cember, 35 men of the 64th were attacked and 22 died. O officer of the 8th and one of the 64th have been attacked a recovered; one man of the 8th and one of the 60th depot Kurrachee have been attacked and died. The latest admissi for cholera at Kurrachee was in the 60th depot on the January, and none remained under treatment in the middle that month. The cases that have occurred during the year in the

		Admitted.	Died.
10th Hussars	Kirkee	5	5
8th Regiment	Kurrachee	3	1
22d do.	Colaba	2	2
„ do.	Kurrachee	1	0

		Admitted.	Died.
64th Regiment	At Sea	2	1
" do.	Poona	36	15
" do.	Kurrachee	26	15
78th do.	Belgaum	2	0
" do.	Colaba	1	0
83d do.	Khandalla	2	0
" do.	Poona	28	22
83d do.	Deesa	2	1
Total		116	62

Bowel Complaints.

	From an average strength.	Were admitted.	Died.	Being per 1000 Admissions to strength.	Deaths to admissions.
At Colaba	586	404	20	655	52
Poona	1512	605	24	397	40
Kirkee	671	279	7	416	25
Belgaum	681	119	7	188	59
Deesa	1145	370	4	323	11
Kurrachee	1324	502	15	379	31
Hydrabad	489	171	6	350	35
Peshawar	495	105	7	212	66
Aden	208	40	1	192	25
At Sea	349	40	1	121	25
Duty men	7410	2635	86	356	33
Invalids	38	15	1	132	66
Total	7448	2650	87	342	32

In Comparison with last year.—Bowel complaints have prevailed and proved fatal in nearly the same proportion as last year for the whole command, but with increase and diminution at particular stations.

The Increase of Admissions has been at		The Diminution at	
Colaba,	271	Kirkee,	35
Poona,	77	Belgaum,	43
Deesa,	42	Kurrachee,	9
Hydrabad,	159	Per 1000 of the strength.	

While of Mortality.

The Increase is at		And Diminution at	
Poona,	6	Colaba,	26
Belgaum,	18	Kirkee,	29
Hydrabad,	35	Deesa,	26

Per 1000 of the admissions.

The next table gives the comparative prevalence and mortality of fevers and bowel complaints at different stations, for the last two years, in which one indicates the maximum, and seve ten the minimum proportion of admissions to strength, an deaths to admissions per 1000.

	Fevers.							Bowel Compl		
	Prevalence this	last year.	Mortality this	last year.				Prevalence this	last year.	Mor thi y
Colaba,	2	3	6	2		...		1	3	3
Poona,	4	2	1	5		...		3	4	1
Kirkee,	3	6	4	3		...		2	1	7
Belgaum,			8	8	...	...	...	9	6	2
Deesa,			5	5	2	4	...	6	5	8
Kurrachee,			6	7	3	6	...	4	2	6
Hydrabad,			2	1	7	7	...	5	7	5
Field Service,			...	4	...	...	...	...	6	...
Peshawar,			1	...	3	...	...	...	...	...
Aden,			7	...	...	...	...	8	...	...
At Sea,			8	...	...	...	...	10	...	9

From this comparison it appears, 1*st,* That fevers were prevalent last year in the field, this year at Peshawar; and in prevalence at Colaba; 3*d,* Kirkee; 4*th,* Poona and Hy bad; 5*th,* Deesa; 6*th,* Kurrachee; 7*th,* Aden; and 8*th,* smallest proportion as well as mildest form at Belgaum, w there was not one fatal; also that the most fatal prevailed Poonah.

2*d,* That bowel complaints were most prevalent at Cola and least prevalent as well as least fatal at Aden, where they not lost a case in five months; 2*d,* in prevalence at Kirke 3*d,* Poona; 4*th,* Kurrachee; 5*th,* Hydrabad, and 6*th,* Dee That they were most fatal at Peshawar, 2*d,* in fatality at B gaum; 3*d,* Colaba; 4*th,* Poona; 5*th,* Hydrabad; 6*th,* K rachee; 7*th,* Kirkee, and 8*th* Deesa.

Specific Stomach and Bowel Complaints.—To the class stomach and bowel complaints have been referred

	Admitted.	Died.
Peritonitis,	6	...
Gastritis	10	...
Enteritis,	4	2
Colonitis,	1	...
Hæmatemesis	9	...
Dysenteria acuta,	717	54
... chronic,	129	21
Diarrhœa,	1007	9
Dyspepsia,	346	...
Colica,	280	...
Obstipatio,	151	...
Total	2660	86

Abdominal Inflammation.—Of twenty-one cases admitted under peritonitis, gastritis, enteritis, and colonitis, two of enteritis terminated fatally in the 83d regiment.

Dysentery.—Of 846 admitted for dysentery, acute and chronic, 75, or one in eleven one-third died. Of these cases were

At	Regiments.	Acute. Admitted.	Acute. Died.	Chronic. Admitted.	Chronic. Died.	Total. Admitted.	Total. Died.
Colaba,	22d,	92	11	17	4	109	15
	78th,	47	2	18	2	65	4
Total,		139	13	35	6	174	19
Poona,	64th,	101	2	11	2	114	6
	83d,	87	12	2	2	89	14
Total.		188	16	13	4	201	20
Kirkee,	10th Hussars,	26	1	8	1	34	2
Belgaum,	78th Regt.	46	7	6	...	52	7
Deesa,	86th „	52	2	7	...	65	2
Kurrachee	8th „	64	3	10	...	54	3
	22d „	28	2	23	4	51	6
	60th „	8	...	2	...	10	...
	64th „	100	4	2	...	102	4
Total,		200	9	37	4	237	13
Hydrabad,	8th Regt.	31	2	12	4	43	6
Peshawar,	60th „	21	3	5	1	26	4
Aden,	78th „	7	...	2	1	9	1
Invalids,		...	...	5	1	5	1
Total,		716	53	130	22	846	57

10*th Hussars.*—In the 10th Hussars the disease was less prevalent and more tractable than last year. Of 26 acute cases, 11 occurred in July during the height of the rains, and 4 in August; and of 148 of diarrhœa 97 occurred in the monsoon. Tubercles of the spleen, as well as ulceration of the intestines, were found in one of the fatal cases.

8*th Regiment.*—Of 10 fatal cases in the 8th regiment, 6, out of 43 attacked, occurred at Hydrabad, 3 at Kurrachee out of 70 and 1 at Colaba in an invalid.

The 22d regiment has suffered more from dysentery than any other corps. The right wing at Colaba having lost 15 out of 100 admissions, and the left wing at Kurrachee 6 out of 51. The last monsoon was of unusual severity, and the fall of rain greater at Bombay than any year since 1828. At the Queen's Depôt, Colaba, 117½ inches of rain fell during the monsoon, yet in the hot months of April and May, hepatic and dysenteric complaints were much more prevalent than during it. The 78th lost 7 men from dysentery to November at Belgaum, 4 more to 31st March at Colaba. Affections of the bowels became very prevalent in that corps in December and January, and are ascribed by Dr M'Kinnon, the senior assistant surgeon, to the alternations betwixt the mid-day heat and the cold dry easterly night winds. The 83d, one of the newly-arrived regiments, lost 14 cases of dysentery, which began to appear in that corps soon after the rains set in at Poona. One case only occurred in June, 52 and 3 deaths in July, 20 and 6 deaths in August, 11 and 4 deaths in September. In October 3 cases only, and no deaths. A fatal case in November, but no admissions for dysentery in December or January, and one case in February, making 89 admissions and 14 deaths in all. Though a more sickly corps than the 83d, the 64th lost only 5 men at Poona and 6 at Kurrachee from dysentery. In that corps it presented two forms, the one attended by colonitis and very severe, the other mild. One of the fatal cases was complicated with the rupture of a blood-vessel and extravasation of blood to the bulk of a hen's egg on the right posterior lobe of the cerebrum, causing hemiplegia of the left side and epileptic fits. The large intestines were thickened, congested, and ulcerated. A young recruit, who had suffered from *cynanche parotidvea*, followed by a deep-seated abscess which burst into the internal ear in July last, remained in hospital with the hearing gone, the motion of the right side much impaired and feeble from an attack of cholera at the end of the military year.

Dysentery, 60*th Regiment.*—Bowel complaints have not in general been of a formidable nature in the 60th regiment. There were 138 admissions and 8 deaths. Of the fatal cases some were combined with abscess in the liver, others were the sequelæ of intermittent fever. The admissions returned under dysentery at Peshawar are 26, and deaths 4; at Kurrachee, admissions 10, deaths none.

86*th.*—Of 486 admissions for abdominal diseases at Deesa, 84 occurred from April to June, 176 from July to September, 105 October to December, and 121 January to March. There were 11 fatal, chiefly in September, October, and November.

Diarrhœa.—Nine fatal bowel complaints in 1007 admissions are returned under diarrhœa, 4 in the 60th regiment, and one rerespectively in the 64th, 78th, 83d, and 86th regiments.

Hepatic Diseases.—Diseases of the stomach and bowels stand first, cholera morbus second, fevers third, and hepatic diseases fourth, as the causes of death among the troops during the year, and the derangement and disorganization of this organ are very often the prelude and concomitant of fatal dysentery in this as in other climates. To this class are referred

In the	Acute Hepatitis.		Chronic Hepatitis		Icterus.		Totals.	
	Admitt.	Died.	Admitt,	Died.	Admitt.	Died.	Admitt.	Died.
10th Hussars	23	...	33	2	6	...	62	2
8th Regt.	56	1	66	4	14	...	136	5
22d ,,	47	5	84	5	9	...	140	10
60th ,,	17	3	9	2	20	...	46	5
64th ,,	29	3	15	...	20	...	64	3
78th ,,	58	2	55	6	7	...	120	8
83d ,,	4	1	2	1	5	...	11	2
86th ,,	28	...	60	5	7	...	95	5
	262	15	324	25	88	...	670	40

Hepatic Diseases.—From this table we may at once assume that the men of the 83d regiment have sounder abdominal viscera than those of any other corps in the Queen's service. Such was the case two years ago with the 8th regiment, before it had sent a wing to Colaba, or left Poona; but the proportion of its admissions for hepatic diseases, next in amount to that of the 22d, now tells a less flattering tale.

Hepatic diseases bear a proportion of above 4 per cent. to the whole admissions, and 12 per cent. to the whole deaths. Of the fatal cases, 10 occurred in the 22d, 8 in the 78th, 5 respectively in the 8th, 60th, and 86th regiments, 3 in the 64th, and 2 in the 10th hussars and 83d; the strength of the hussars being 675, and of the foot regiments 1170. Of 136 cases (including icterus) in the 8th regiment, 64 occurred and 4 died at Kurrachee, 57 occurred and one died at Hydrabad. By instructive tables of calculations given in Dr Tice's Report, it appears that during the last 3 years and 8 months, embracing August 1846 to March 1850, 633 cases of hepatitis have occurred in the 8th regiment. Of the cases

1 in $3\frac{99}{178}$ of the number were relapses which had occurred once in 50 men, twice in 25, three times in 18, four times in three, and 6 times in two.

2. The average number of days every case was under treatment, was $6\frac{1}{4}$.

3. Of 633 case 7, or 1 in $90\frac{3}{7}$, died.

In the majority of the fatal cases of dysentery in the 8th regiment hepatic abscess was associated with the intestinal disease.

60th.—In the 60th regiment many of the cases of hepatic disease occurred in April whilst encamped at Jamrood after the termination of the campaign.

64th Regiment.—Of acute hepatitis in the 64th, were 29 admissions, chiefly in Poona, two of them terminating fatally; one case also died at sea.

78th Regiment.—Assistant-surgeon M'Kinnon dissents from the opinion that Belgaum gives predisposition to hepatic diseases. The men of the 78th regiment who arrived from England while it was quartered there, became stout and ruddy with every appearance of good health; but since the wing came to Colaba in November these men look ill, thin, and sallow. This change, though often aided by intemperate habits, must be chiefly ascribed to the high temperature and relaxing climate of Bombay. In November there was no case of hepatitis, but nine of deranged function of the liver. From December to 31st March inflammatory and other diseases prevailed, and seemed to increase in proportion to the advance of the hot weather. Dr M'Kinnon gives a table embracing useful observations on this subject, and subjoins several well written dissection reports. At Belgaum and Aden together, 86 cases of acute and 43 of chronic hepatitis have been treated; two of them remained from last year, one was admitted four, two three times, eight twice. The acute cases occurred chiefly at Belgaum, in the rains, and several required the most active treatment. Abscesses were found in fatal cases. At Aden there have been several relapses, and the cases which occurred were chiefly subacute and chronic, in no case requiring general blood-letting. Men of drunken habits have been the chief sufferers from the disease.

83d Regiment.—Large abscesses were found in the livers of the two cases that terminated fatally in the 83d Regiment.

86th Regiment.—At Deesa 88 cases were admitted and six died of hepatitis. The cases were more severe in the hot than in the cold season. Hepatic abscess often forms here and in other parts of India without any preceding stage of acute inflammation.

Hæmatemesis at Deesa.—Of nine cases of hæmatemesis in the command seven occurred at Deesa, six of them in April and May, the two hottest months of the year. This disease appears to Dr Thom to be connected "with that vascularity and plexiform patches of congested vessels, observed on the mucous coat of the stomach, and dependent on high temperature and the use of drams of arrack. Acids always cured it in a very decided manner, and he found the same remedies, particularly nitric acid, equally useful in many cases of dyspepsia."

Pulmonic Diseases.—For diseases of the lungs were

	Admitted.		Died.
Bronchitis, .	90	...	5
Pneumonia, .	37	...	3
Pleuritis, .	10	...	1
Catarrhus acutus .	11	...	0
„ chronicus,	282	...	1
Hæmoptysis .	73	...	4
Phthisis pulmonalis	29	...	20
Dyspnœa continua,	18	...	0
Total,	550	...	34

Bronchitis.—Of bronchitis, 33 cases occurred at Deesa, 21 in the 83d regiment, 13 in the 78th, 12 in the 64th, and 11 in the 8th. Five cases terminated fatally, one in the 8th at Kurrachee, four in the 83d, two of them at sea, one in Poona, and one in the Queen's depot. One of the fatal cases was combined with, and probably arose from organic disease of the heart, which was surmised during life, and found on dissection.

The 13 cases of bronchitis in the 78th at Colaba occurred chiefly in January and February, and were easily treated.

The four fatal cases in the 83d had been contracted at sea, where two of them died, and were all along under treatment.

Pneumonia, Pleuritis, and Catarrh.—Three out of 37 admitted died under pneumonia, one out of 11 under pleuritis, one out of 282 returned as acute, and four out of 73 of chronic catarrh. Seventeen, or nearly one-half of the cases of pneumonia, occurred at Deesa. They were almost confined to the cold months; not a single case occurred in the first quarter, and only two in the second. One man who had been admitted with symptoms of pneumonia died from the bursting into the pleura of an aneurism the size of a duck's egg at the commencement of the descending aorta. Of 71 cases of catarrh in the 86th, only 15 occurred in the first six months, and 46 in the second. During which last the air was dry and subject at night and in the mornings to sudden vicissitudes of heat and cold. The usual form was gastro-catarrhal, the mucous membrane of the stomach and intestines, as well as the bronchi, being engaged, and diarrhœa, a common termination. In the treatment, Dr Thom found antimonials inadmissible when the mucous coat of the stomach was involved, but ipecacuanha in nauseating doses a safe and effectual remedy.

Of 282 cases of acute catarrh, one, and of 73 of chronic, four terminated fatally.

Phthisis Pulmonalis.—Twenty-nine admissions and twenty deaths are referred to *phthisis pulmonalis.* The fatal cases were, in the 83d, 6; 64th, 5; 8th, 3; 86th, 3; 22d, 2; 10th; Hussars and 78th, each, one.

Morbus Cordis.—Under *morbus cordis* palpitatio carditis, and pericarditis have been returned, 78 admissions and two deaths, 25 in the 10th Hussars, 11 in the 83d, 11 in the 64th, five in the 8th, two in the 22d. The fatal cases occurred in the 60th at Kurrachee and 78th at Belgaum. Twenty-five cases, but only 17 individuals were admitted in the 10th Hussars. One of them had disease of the brain, also disease of the lungs from previous pneumonia; one was ascribed to injuries received in falls from horseback; another to a severe beating from a comrade. The number requiring change of climate for cardiac symptoms was fewer than last year; from the smaller number of recruits, and from the horses of the regiment, being now thoroughly broken in, so that the amount of hard riding at Kirkee has been much diminished. One delicate lad was three times admitted for palpitation from the exertion of blowing a trombone in the band. He was removed to the ranks, and the symptoms have disappeared. Of 11 cases in the 64th regiment, five were relapses, none indicated organic disease, and they have all returned to duty. Of five cases in the 78th, two occurred at the top of the Ramghaut on the march to Vingorla from exposure to wet; one was cardialgia and relieved by opiates and leeches; one of pericarditis, in a subject tainted with syphilis, was cured by a mild mercurial course; the third was very like the second. In the fourth, irregular and tumultuous action of the heart, with intermitting pulse, were relieved by the periodical abstraction of blood, antimony, digitalis, and antispasmodics. Of six cases at Deesa, there was reason to suspect in one dilatation of the right ventricle, and he was invalided. In all the others, the cardiac symptoms, though obstinate and prolonged, appeared to be symptomatic of gastric or abdominal disturbances. A man, apparently in good health a few minutes before, met instant death out of hospital while in the privy, from the bursting into the pericardium of a small aneurism on the outside of the aortic valves. There was no other sign of recent disease of the heart, although its surface was covered with white spots from the effects of former pericarditis.

Brain and Nervous System.—To diseases of the brain and nervous system are referred

	Admissions.	Deaths.
Cephalalgia,	26	—
Vertigo,	1	—
Ictus solis,	5	4

	Admissions.	Deaths.
Apoplexia, ...	30	23
Paralysis, . . .	12	2
Epilepsia, . . .	24	—
Neuralgia, . . .	3	—
Amentia, . . .	32	—
Mania, . . .	6	—
Delirium tremens, . .	33	4
Total,	172	33

Apoplexy and Ictus Solis.—Of 27 cases of apoplexy and *ictus solis* there occurred at

		Colaba.	En route to Poona.	Kirkee.	Bel-gaum.	Kurra-chee.	Hydra-bad.	Pesha-war.	Total.
April	6.	0	0	1	0	0	0	0	1
	10.	0	1	0	0	0	0	0	1
	22.	0	1	0	0	0	0	0	1
	23.	0	1	0	0	0	0	0	1
	25.	1	0	0	0	0	0	0	1
	28.	0	1	0	0	0	0	0	1
	30.	0	2	0	0	0	0	0	2
June	1.	0	1	0	0	0	0	0	1
	9.	0	0	0	0	0	1	0	1
	10.	0	0	0	0	1	1	0	2
	11.	0	0	0	0	0	1	0	1
	12.	0	0	0	0	0	1	0	1
	15.	0	0	0	0	0	1	0	1
	16.	0	0	0	0	0	1	0	1
July	27.	1	0	0	0	0	0	0	1
	28.	0	0	0	0	0	0	1	1
	29.	0	0	0	0	0	1	0	1
Aug.	4.	0	0	0	0	0	0	1	1
	6.	0	0	0	0	0	0	1	1
	11.	0	0	0	0	0	0	1	1
	12.	0	0	0	0	0	0	1	1
	13.	0	0	0	0	0	0	3	3
Oct.	26.	0	0	0	I	0	0	0	1
Total,		2	7	1	1	2	6	8	27

En route to Poona.—Of these fatal cases, seven occurred betwixt the 10th May and 1st June in the 64th and 83d regiments, on their march from Panwell to Poona, in oppressively hot weather, five betwixt the 9th and 16th June, and one on the 29th July at Hydrabad, eight betwixt the 28th July and 13th August at Peshawar, and no cause but inconsiderate exposure to the oppressive heat of the climate in these months can be assigned for them. At Hydrabad the month of June was extremely close and sultry, the thermometer being 98° in the hospital during the heat of the day. The patient was generally brought into the hospital in a state of complete insensibility, with a full intermitting pulse, hot skin, and stertorous breathing. There was in most instances a puffing out of the cheeks, and discharge of frothy mucus from the mouth, the countenance was turgid and livid, pupils contracted, muscular movements of the upper and lower limbs, and involuntary discharge of urine and fæces; shortly before death, breathing became slower and more laborious, pupils suddenly dilated, profuse perspiration broke out, and the pulse became very quick and small. The men attacked were generally of intemperate habits.

Kirkee.—The case at Kirkee occurred in a man of good character, who had committed no irregularity or imprudence. He was seen within a few minutes by two medical officers. By stimuli he was roused with difficulty, but hemiplegia of the left side with stertorous breathing, intervened, and he died in forty-seven hours. The membranes of the brain were found thickened, and blood estravasated on the hemispheres, to the size of the palm of the hand, with softening of the cerebral substance. The pericardium contained blood coagulated and fluid, the arch of the aorta was thickened, but became thin in approaching the heart, and had sustained a small rupture.

Paralysis.—In the 10th Hussars one man was admitted twice for paralysis, and another twice for delirium tremens. The paralytic seizure was in the right hand, more particularly the flexor muscles, and ascribed to a stroke of the land-wind. Another very serious case was brought on by an all but fatal drinking bout, which left the patient a helpless paralytic in every limb; but from this condition he has gradually rallied, and can walk slowly with a stick.

86*th*—Of two cases returned under paralysis in the 86th regiment, one had recovered in the end of March from coup de soleil, and is referred to in Part III. The patient, 29 years old, had been eight years in the Presidency, and often undergone treatment for dysentery, hepatitis, secondary syphilis, and other complaints, including two attacks of cholera morbus and two of delirium tremens. His last admission was on the 20th July, with great nervous depression and convulsive twitchings of the left arm. On and after the evening of the 21st he had repeated general convulsions with stertorous breathing, followed by stupor and coma, at first temporary but latterly permanent, betwixt the paroxysms, up to the 27th, when he died. On inspection were found congestion of the cerebrum with thin layers of lymph on its surface, and under its middle lobe, over the petrous portion of the left temporal bone, an oval shaped depression an inch long, half an inch broad, and three lines deep, which corresponded to an eminence on the upper surface of the bone. The pia mater covering the depression was vascular, with the surrounding cerebrum, very little softened, and slight serous effusion in the base of the skull and spinal canal. By application of the trephine the bone under the depression, near the tympanum, was found to be carious, its interstices filled with a soft fatty-looking, dark-coloured matter, with a small opening of communication with the external ear.

Amentia and Mania.—Thirty-eight cases are returned under amentia and mania,—15 in the 64th, 5 in the 8th, 6 in the 60th, 3 in the 78th, 3 in the 83d, and 2 in the 86th regiment; but many of these were re-admissions, and under observation only. Four individuals in the 64th furnished all the admissions. These were brought before the General Invaliding Committee, and sent back to their regiments for observation and treatment.

Small and Chicken-Pox.—Six admissions for small-pox, and five for chicken-pox appear in the returns;—two in the 86th, three in the 60th, and one in the 78th Regiment. Two cases were fatal; one in an invalid of the 60th at Colaba; one in the head quarters at Peshawar; the last in the month of June, when the patient, having to endure a temperature of 105°, the excessive heat affected his head, and he died rather suddenly. The disease, modified by vaccination, had been previously going on well.

Three cases of varicella in the 64th at Poona, two in the 86th at Deesa.

Dropsy.—For dropsical complaints were

	Admitted.	Died.
Anasarca,	10	1
Hydrothorax,	1	...
Ascites,	3	3

The cases of ascites were in the 10th Hussars, 78th, and 86th regiments, one of them an invalid.

Rheumatism.—To rheumatic complaints are referred in the

	Admissions.	Deaths.
10th Hussars,	109	...
8th regiment,	90	...
22d ...	90	...
60th ...	34	...
64th ...	61	1
78th ...	88	...
83d ...	97	...
86th ...	192	...
	763	1

Of these cases were acute, 304; chronic, 420; lumbago, 3 odontalgia, 3: 190, *i. e.*, one-fourth of the whole occurred Deesa.

One chronic case in the 64th terminated fatally at Poona.

Venereal Complaints at every Station in every Corps.—V nereal complaints comprise

		Primary Ulcers.	Syphilis Consecutiva.	Bubo.	Gonorrhœa.	Hernia Humoralis.	Strictura.	Cachex. Syphil.	Phymoses et Paraphymoses.
Colaba,......	22d,	9	2	12	9	14	...	...	2
	78th,	24	10	4	12	9	...	1	...
	Tot.	33	12	16	21	23	...	1	2
Poona, ...	64th,	48	10	23	32	9	...	...	...
	83d,	58	20	67	26	21	2	2	6
	Tot.	106	30	90	58	30	2	2	6
Kirkee,.........	10th,	54	4	69	61	20	5	...	...
Belgaum,......	78th,	93	53	46	49	20	...	...	2
Deesa, ...	86th,	79	14	95	50	33	1	2	1
Kurrachee,	8th,	23	37	13	15	14	...	3	...
	22d,	14	6	3	11	7	...	...	...
	60th,	12	5	3	2	1	1	...	...
	64th,	14	4	17	13	2	...	...	...
	Tot.	63	52	36	41	24	1	3	...
Hydrabad,......	8th,	58	11	57	61	16	2	...	2
Peshawar,......	60th,	27	1	29	20	24	2	...	...
Aden, ...	78th,	15	1	6	3	7	2	...	
At Sea,...	64th,	...	3	1	..	...	...	...	
	83d,	9	13	2	7	4	...	...	
	Total,	9	16	3	7	4	...	...	

	Primary Ulcers.	Syphilis Consecutiva.	Bubo.	Gonorrhœa.	Hernia Hermoralis.	Strictura.	Cachex. Syphil.	Phymoses et Paraphymoses.	Total.
Queen's Depot,......	1	7	...	...	...	...	1	...	9
Total,......	538	201	447	371	201	15	9	14	1796

Cases of Secondary Syphilis.—Of these, four terminated fatally,—three under secondary syphilis, one under cachexia syphiloidea,—two of them in the 8th, two in the 78th Regiment, one of the 8th, an invalid, in whom extreme debility appeared to be the cause of death. In the other, at Belgaum, a most offensive muco-purulent fluid was found in front of the *sella turcica*, and about the olfactory nerves, with an opening in the cribriform plate of the ethmoid bone, through which the matter had passed from the nose. The nasal and superior palatine bones, as well as the tonsils, were almost totally destroyed by ulceration. The liver and spleen were enlarged, and a *lumbricus teres* found in the jejunum, but the stomach and bowels were otherwise healthy.

The fatal case returned under *cachexia syphaloidea* occurred in the 8th Regiment at Kurrachee. On inspection of the body, the face was studded with scars from former ulcers, and the limbs with the conical eruption of rupia. The branches of the meningeal artery were distended with a milky-looking serum, the cortical substance of the brain softened, and the ventricles aud upper part of the spinal canal distended with serum.

This patient had experienced an attack of hemiplegia at Poona, but so far recovered, first in the upper, then in the lower extremities, as to be able to march to Hydrabad, a distance of ninety miles. Not long after, he was attacked with *rupia prominens*, and alarming debility, which induced his medical attendant to recommend his removal to Kurrachee, where he lingered only a few days.

Ophthalmia.—Of ophthalmic diseases, were admitted in the

10th Hussars,	8th.	22d.	60th.	64th.	78th.	83d.	86th.	Total.
24	48	18	106	140	49	136	51	572
Of cutaneous diseases.								
0	2	6	0	6	31	21	2	68

Ulcers and Abscesses—Under ulcers and abscesses appear in

	10th Hussars,	8th Reg,	22d.	60th	64th	78th.	83d.	86th,	Total	Died
Phlegmonic Abscesses.	101	96	69	27	40	41	67	52	493	1
Paronychia,	...	1	1	1	4	1	3	2	13	...
Apostema Lumbare	1	...	...	...	...	...	...	...	1	1
Ulcus simplex,	54	14	27	8	61	71	46	41	322	1
Grave,	...	...	...	...	...	...	2	...	2	...
Oris,	...	...	...	...	...	...	1	...	1	...
Fistula in ano,	...	5	...	...	...	...	...	...	5	...
Total,	136	116	97	36	105	113	119	95	837	3
Total,	1	...	...	...	..	...	1	1	...	...

Lumbar abscess.—There were two cases of lumbar abscess, one in the 10th Hussars, one in the 83d regiment, both fatal. The last occurred in a young soldier, who was ill nearly all the voyage from Ireland, an immense tumour having formed on the lumbar region. He was left in the depot hospital, Colaba, on his arrival, and afterwards sent to Poona, where he died. There were various openings in different directions communicating with each other among the muscles; but unconnected with disease of the spinal bones.

Wounds and Injuries.—Of wounds and injuries the 60th Rifle regiment, so hotly engaged in the siege of Mooltan, and other field operations, last year, has a smaller proportion than any other corps, being twenty-one in seven months from 1000 men, while the 10th Hussars had 114 in twelve months, from a strength of 675; but this last is much above the average, as dragoons are much more liable to small wounds and injuries, incapacitating them for immediate duty than foot soldiers.

Under this head are comprised

	10th Hussars.	8th.	22d.	60th.	64th.	78th.	83d.	86th.	Total.
Luxatio .	...	1	4	...	...	...	...	1	6
Subluxatio .	18	25	10	8	19	25	5	8	118
Vulnus Sclop.	...	...	...	...	...	...	1	2	3
Vulnus Incisum	22	3	15	2	15	16	5	9	87
Fractura .	1	2	...	2	...	3	2	1	11
Contusio .	83	43	21	9	28	33	33	26	276
Ambustio .	...	2	1	...	10	1	3	2	19
Total	124	76	51	21	72	78	49	49	520

None of these were fatal.

There were no corporal punishments during the year in the 10th Hussars, the 8th or the 33d regiment. There were four in the 22d, 3 in the 64th, 2 in the 78th, 2 in the 86th, and 1 in the 60th regiment; 12 in all, or one in 628 of the whole force.

Under other diseases are returned

	10th Huss.	8th.	22d.	60th.	64th.	78th.	83d.	86th.	Total.	Died.
Aneurisma .	...	1	...	...	...	...	...	...	1	...
Atrophia .	...	1	...	...	...	...	..	...	1	...
Contractura .	2	1	...	...	2	...	...	...	5	...
Cynanche Tonsilaris	4	15	4	14	8	13	24	12	94	...
„ Trachealis	...	...	...	...	1	2	...	1	4	...
„ Parotidaea	...	1	...	...	2	...	1	1	5	...
Cystitis .	...	1	...	...	...	1	...	...	2	...
Dracunculus .	12	12	5	...	...	...	...	13	42	...
Dysecæa .	1	2	...	...	2	...	...	...	5	...
Dysuria .	1	...	2	1	...	...	...	4	8	..
Eneuresis .	...	...	...	...	1	...	...	...	1	...
Epistaxis .	...	...	...	...	1	3	...	3	7	1
Erysipelas .	...	...	...	...	1	1	2	...	4	1
Erythema Mercur.	...	...	...	...	...	...	...	1	1	...
Fungus hæmatodes	...	1	...	...	...	...	...	...	1	...
Hæmorrhois .	6	24	24	2	10	7	6	9	88	...
Hernia Inguinalis	2	2	...	...	...	2	...	3	9	...
„ Strangul.	...	1	...	...	...	...	...	...	1	...
Hydrocele .	1	3	2	...	...	...	...	2	8	...
Morbus Coxarius .	...	1	...	...	...	...	...	...	1	...
Morbus Cordis .	25	5	2	...	11	13	1	5	62	1
Necrosis .	1	1	...	...	1	1	...	...	4	...
Nephritis .	...	4	...	...	4	1	...	2	11	1
Otitis .	2	13	5	1	5	9	...	8	43	...
Observatio .	...	...	1	...	...	...	1	15	17	...
Palpitatio .	...	5	...	5	...	...	3	...	13	...
Pericarditis .	...	1	...	1	...	...	1	...	3	1
Periostitis .	...	...	...	...	...	...	2	...	2	...
Prolapsus Ani .	1	3	2	...	...	...	...	...	6	...
Sarcocele .	...	1	...	...	...	...	...	...	1	...
Scorbutus .	...	4	1	1	7	2	6	20	41	2
Scrofula .	2	23	2	4	13	5	8	14	71	1
Splenitis .	5	30	21	9	3	25	3	8	104	1
Tumours .	...	1	...	...	3	...	...	...	4	...
Tympanitis .	...	...	...	...	...	1	...	...	1	...
Varix .	1	...	2	...	...	...	...	1	4	...
Vermes .	5	7	6	...	3	...	...	2	23	...
Verrucae .	...	2	...	...	3	2	3	4	14	...
Total .	71	166	79	38	81	88	61	128	712	9
Total .	...	2	...	1	...	2	1	2	...	...

Popliteal Aneurism.—The first on this list is a case of popliteal aneurism sent from the left wing at Hydrabad to the 8th hospital, Kurrachee. Dr Tice tried to obliterate the sac by pressure; but œdema and threatened erysipelas of the limb compelled him to abandon a method he has seen successfully practised in Europe, and to tie the vessel a little below the origin of the *profunda femoris.* The patient underwent the operation while under the influence of chloroform, without being conscious of more pain than the weight of an imaginary body resting on the inguinal region. The ligature came away in 15 days, when the wound was nearly healed, and the popliteal tumour had become less than a filbert in size.

Cynanche.—Of 103 cases of cynanche 94 affected the tonsils; 4 the trachea, and 5 the parotid glands. Of the whole, 25 occurred in the 83d, 16 in the 8th, 15 in the 78th, from 12 to 4 in the other corps.

Dracunculus.—Of 42 cases under dracunculus, 13 occurred at Deesa, 12 at Kirkee, 11 at Kurrachee, 3 at Hydrabad, and 3 at Colaba.

Epistaxis, fatal case in 78th.—Of 7 cases returned under epistaxis, one out of three had a very narrow escape, one terminated fatally, both at Belgaum.

The fatal case occurred in a private, thirty years old, of a sallow complexion, scrofulous diathesis, and dissipated habits, who the night before his admission, had been found drunk and bleeding profusely from the nose. When brought to hospital he was very pale and weak from loss of blood. Plugs of lint steeped in alum, were applied with temporary success, cold lotions to the head; a mild purgative was administered, and afterwards mineral acids internally, and generous diet was necessary from his weak state. His only bad symptom was want of sleep, for which he took anodynes. A constant oozing of blood but not alarming remained. He was in this state apparently improving until the morning of the 30th, when he became insensible, with heavy breathing, moaning, and scarcely perceptible pulse. Stimulants were administered without effect, and, as Mr Webster was about to perform transfusion for a last resource at 2 P. M., he expired.

On dissection was found effusion in the pericardium and pleura, the former being highly congested; the stomach contained about eight ounces of dark fluid, and its mucous membrane was softened, loose, and abraded. The intestines were of a dark leaden colour, and the spleen enlarged.

The second case was in a stout young sergeant, who had been struck by another man on the nose a week before admission; and though the injury had not troubled him much during that time, when he came to hospital on the night of the 9th October, he was in a state of syncope from loss of blood. Plugs of lint steeped in strong alum were introduced, his head was shaved and cold lotions applied without benefit; but dry cupping to the nape of the neck and shoulders had an almost instantaneous effect, and a permanently beneficial result. The bleeding stopped at 10 A. M., leaving him in a dreadfully weak state. He, however, made a satisfactory recovery, and was discharged on the 19th October.

Erysipelas.—Of 4 cases of erysipelas, one in the 83d regiment died. He was a fine young recruit. The disease attacked the head and face, numerous abscesses formed over the scalp, and he sunk from congestion of the brain after 12 days treatment. The head and face were much swollen, the tissues of the scalp broken by suppuration, the vessels of the brain and pia mater highly distended, and there was copious effusion of bloody serum in the ventricles and base of the brain.

Carditis.—A fatal case under carditis in a young soldier of the 78th regiment, two years and a half in India, who had suffered much from anasarca, and was admitted 9th September 1849, with symptoms of colonitis. Leeches were applied and oil administered. Next day the breathing was oppressed, pulse small, surface covered with perspiration; he moaned, and was unable to speak or swallow. Sinapisms to the chest and stimulants gave no relief, and he died on the 13th. The heart was found enlarged with fatty matter adherent to the pericardium, which contained four ounces and a half of serum.

Calculi passing from Kidney to Bladder.—The following interesting case of two urinary calculi, formed in the left kidney, finding their way through the ureter to the bladder, is abridged from Dr Thom's Report.

86*th Regiment.*—William Craig, aged twenty-two, an Irishman of temperate habits, and leucophlegmatic temperament of three years service, was admitted 19th August 1848, complaining of a feeling of weight in both lumbar regions, of twelve months duration, with dysuria and languor, but no vomiting or pyrexia. He had great difficulty in passing urine, and scalding pain along the urethra; he had no appetite; a pale anxious countenance; dry skin; sunk eyes; and a peculiar bluish tinge of the lower eyelids, with an ammoniacal odour from the body. Urine was stated to resemble at first thick pus, then to become clear. The bowels were open; the urine pale, alkaline, strongly ammoniacal. The urine being ascertained by chemical tests to be albuminous, he was placed on generous diet, vegetables and drinks, and the internal use of nitric acid and nitrate of potass, but with no very obvious advantage. On the 2d September, he passed two small thin, smooth, lamellated pieces of calculus, resembling phosphate of lime. Left kidney was the chief seat of uneasiness, countenance like that of a person with cholera, a strong ammoniacal odour. First warm baths and cupping of the loins, then nitrate of potash and conium, produced no good effect. Then, 5th October, guaiacum mixture was given with great benefit; and on the 8th, the urine was again tested, but no precipitates could, as before, be obtained from it. He appeared to be recovered, and was discharged 17th October. He was re-admitted on the 20th with œdema of the knees, without pain or urinary affection;

but on the 15th, the dysuria with the former langour and in the kidneys, especially the left, returned. Though the analyzed indicated this time the presence of little albumen, g cum was again prescribed, from the beneficial result formerl tending its use, and the morbid symptoms again rapidly d peared. He was discharged 1st November. On the 1st Dece was again admitted with the same symptoms as at first, with quent desire to void urine, which was passed only in d Analysis of the urine gave the same phenomena as before. again recovered under the use of guaiacum. On the 10th he was re-admitted with the same affection. The pain he now fered was exquisite, and the urine could be voided only in d The catheter was passed on two successive days, but no cal could be detected, and very little urine came away. There exquisite pain in the left iliac and lumbar regions, and a cir scribed swelling in the former, which was very tender to the t The bowels became obstinately costive, requiring croton oil; ritoneal inflammation set in, and he died on the 19th April in great agony.

The heart was found soft, flabby, and somewhat enlarged, coagulated lymph in the left ventricle. The descending c adhered to the small intestines in front of the left kidney do its termination in the rectum. From the diseased mass formed betwixt the spleen and pelvis, a small quantity of purulent effusion had escaped into the abdominal cavity, an cellular substance surrounding the kidney was infiltrated purulent matter, which had penetrated in every direction, in ing and compressing and inflaming the parts it touched. left kidney was found in a highly morbid state; soft, flabby, n double its natural size, with several sinuses or small abscess its convex surface, penetrating through the cortical substanc which urine and pus had found their way, not only down sides of the colon but into the peritoneal sac. On laying the kidney its pelvis was seen to form a large sac, divided a into two cells of very unequal size; the cortical substance nishing a thin puckered wall round this morbidly enlarged p so attenuated as to resemble a diseased bladder more th kidney. The corresponding ureter was enlarged almost t diameter of the aorta before its division, and its walls were t ened and almost muscular. It was widest and funnel-shap its termination in the bladder, admitting the finger with ease

In the bladder were found two calculi; one the size of a egg, flattened, and weighing two ounces one drachm. The o much smaller, lay near the neck of the bladder. Their su was smooth and of a light brown, their section white, arrange concentric layers, and composition phosphate of lime. The culi nearly corresponded in size and shape to the cells in the kidney, and from this resemblance, as well as the history of the case, and the extraordinary dilatation of the ureter, there can be no doubt, as Dr Thom infers, that they had been originally formed in the left kidney, and passed along the ureter into the bladder.

Scorbutus.—Forty-one cases of scorbutus have been admitted,—twenty in the 86th; seven, 64th; six, 83d; four, 8th; one, 22d; one, 60th. Two of the cases in the 86th died, the termination being in one hastened or caused by abscess of the liver. On inspection of the body, in the other, were observed marks of previous pericarditis, and an effusion of bloody serum within the chest.

Scrofula.—Of seventy-one cases of scrofula, twenty-three occurred in the 8th, fourteen in the 86th, thirteen in the 64th, from two to eight in each of the other corps. One terminated fatally in the 8th regiment.

Splenitis.—Of 104 cases of splenitis, thirty, and only one fatal, occurred in the 8th regiment, twenty-five in the 78th, twenty-one in the 22d, nine in the 60th, eight in the 86th, five to three in other corps. The fatal case was complicated with disease of the brain, and is detailed in Dr Tice's report.

Pericarditis.—In a fatal case returned under pericarditis in the 60th detachment at Kurrachee, tubercles were found in the lungs, and three ounces of straw-coloured fluid within the pericardium.

The following tables give the numbers and proportion of admissions and deaths, at different ages, and length of service in India.

I. *Influence of Age on Sickness and Mortality*—Ages of Non-Commissioned Officers and Privates.

				Ratio per cent.		
	The strength.	Admissions.	Deaths.	Admissions to strength.	Deaths to strength.	Deaths to Admis.
Under 18 years	133	229	...	172	...	...
18 to 20	689	1425	39	207	5·6	3·9
21 to 22	1527	2675	53	175	3·5	1·9
23 to 25	1968	4033	64	205	3	1·18
26 to 30	1906	3726	98	195	5·14	2·6
31 to 35	706	1277	46	181	6·5	3·5
36 to 40	124	382	16	300	12·9	4·2
43 to 45	8	30	1	375	12	3·3
46 to 50	2½	10	...	400	20	...
Unknown,	15	62	...	493	1	...
	7073	13849	317	196	44	23

This general return is incomplete from the April Monthly Returns of the 64th and 83d, then at sea, wanting the table of ages. It does not include either the average strength, admissions or deaths of those two corps for that month.

From this table it appears that the

Healthiest ages have been in succession.	And the least fatal ages.
1 under 18 years	1 under 18
2 — 21 to 22	2 — 23 to 25
3 — 31 to 35	3 — 21 to 22
4 — 26 to 30	4 — 26 to 30
5 — 23 to 25	5 — 18 to 20
6 — 18 to 20	6 — 31 to 35
7 — 36 to 40	7 — 41 to 45
8 — 41 to 45	8 — 46 to 50
9 — 46 to 50	

II. Length of service in India, embracing officers as well as non-commissioned officers and privates.

				Ratio per cent.		
	Strength.	Admissions.	Deaths.	Admissions to strength.	Deaths to strength,	Deaths to Admissions.
Under 1 year	2466	2132	147	87	5·9	6·9
1 to 2	490	875	23	176	4·7	2.6
3 to 4	1478	4689	30	317	2·03	·66
4 to 5	934	1952	13	210	1·39	·66
5 to 6	365	417	12	114	3·29	2·88
6 to 7	380	583	6	153	1·58	1·03
7 to 8	1035	1367	27	132	2·7	1·9
8 to 9	341	320	16	94	4·7	5
9 to 10	134	123	5	92	3·73	4·14
10 to 11	52	41	—	79	—	—
11 to 12	47	22	—	47	—	—
Above 12	27	11	—	41	—	—
Total,	9053	14451	331	1596	3·65	2·07

From this table the

Healthiest periods of residency in the Presidency have been	The least fatal periods
1 above 10 years	1 above 10 years
2 under 1 "	2 betwixt 4 and 5
3 betwixt 8 and 10	3 — 6 and 7
4 — 5 and 6	4 — 3 and 4
5 — 7 and 8	5 — 7 and 8
6 — 6 and 7	6 — 5 and 6
7 — 1 and 2	7 — 9 and 10
8 — 4 and 5	8 — 1 and 2
9 — 3 and 4	9 — 8 and 9

PART V.—*On Venereal Diseases and the influence of Lock Hospitals in their prevention, in the Presidency of Bombay.*

1. The records of the deputy inspector general's office in Bombay commence 21st December 1825, and embrace a period of 22 years, during the first 11 of which lock hospitals existed in Poona and Belgaum, though Queen's troops were not quartered at Belgaum before 1829.

2. The comparative prevalence of venereal diseases, in different years and periods and at different stations in the command, is shown in a "Return of Venereal Diseases, admitted annually into Her Majesty's European Military Hospitals, at different stations in the Bombay Presidency, from 21st March 1826 to 31st December 1849," which I have compiled from the Quarterly Sick Returns.

3. In 1826, women infected with venereal diseases were permitted to go at large in the neighbourhood of military cantonments, the purlieus of which and adjacent nullahs were their usual haunts, where they had every facility of communicating disease to the soldiers, while it was optional to themselves either to seek or decline medical treatment in lock hospitals, and few, if any, resorted thither for a cure, until incapacitated by the severity of their sufferings, or the unchecked progress of their disease from earning a livelihood in the way of their profession. In the city of Poona, more especially, were large numbers of abandoned females who lived chiefly by the military and their followers.

4. In the year ending 20th December 1826, venereal diseases formed one-third to one-fourth part of a heavy sick list in the European regiments.

The average strength being	2973	The Venereal admissions.	1621	The ratio per cent.	54·52

5. The quarterly sick returns, but not the annual, specify the stations at which particular diseases occur, and the former commence in this presidency a quarter of a year later than the latter, that is, on the 21st March 1826. Of 289 cases which occurred in the first quarter of 1826, and are included in the 1621 admissions, the localities are unknown. Towards the remaining 1332 cases, distributed over the last three quarters,

		Strength of	Contributed.	Being per cent. for the period.	Per cent. per annum.
The 4th Light Dragoons.	In 2 quarters at Kaira from a	530	62	13·04	26·08

		Strength of	Contributed.	Being per cent. for the period.	Per cent. per annum.
The 4th Light Dragoons.	In one quarter at Kirkee,	400	5	·25	5·
2d Foot.	in three quarters at Poona,	933	521	55·81	69·8
20th Foot.		982	569	57·74	72·17
The two last together,		1915	1088	56·81	71.
6th Foot.	in three quarters at Colaba.	641	177	26·37	36·48

6. In December 1826, the commanding officer of Her Majesty's 20th regiment prohibited his men from frequenting the haunts of prostitutes in or near the city of Poona, and employed peons at the expense of the regiment, to take up for medical inspection all women of suspicious character found in the cantonment, and to place such as were diseased in the lock hospital for cure. These summary proceedings being followed by a marked decrease in the number of venereal cases in the 20th hospital, and practised soon after with similar success in the 2d Queen's, the commander in chief became satisfied of their utility, and government, approving of them, attached police peons to every corps with a moocadum over them, at the public expense, and allowed them a premium of one rupee in addition to their pay for every diseased woman they brought to hospital. Lhol bazaars, or establishments of females for the use of the men, with a strict superintendence of the health of the inmates, and their transfer for treatment when diseased to lock hospitals, appear also to have been introduced about this time; but are only incidentally noticed in the records of the deputy inspector general's office.

7. Here are given the results of these measures, actively prosecuted for three years, after that of their introduction.

			The strength was	Venereal admissions.	Ratio per cent. per annum.
In the whole Command.	In the year	1826	2973	1621	54·52
		1827	3361	996	29·6
		1828	3239	607	13·74
		1829	3644	688	18·88
		1830	3831	661	17·1
	In 3 quarters of	1826	1537	1093	71·11
At Lock Hospital Stations.	In the whole year	1827	2086	868	41·61
		1828	2476	536	21·61
		1829	2469	584	21·78
		1830	2971	621	20·19

			The strength was	Venereal admissions.	Ratio. per per cent. annum.
In the 20th Regiment, Poona.	In 3 quarters of	1826	982	567	72·17
At Colaba and Bombay.	In the year	1827	955	396	41·46
		1828	942	167	17·83
		1829	893	72	8·09
		1830	808	38	4·7
In the 2d Queen's at Poona.	In 3 quarters of	1826	933	521	69·8
	In the year	1827	756	416	55·03
		1828	947	246	21·97
		1829	892	130	14·57
		1830	843	70	8·3
In Her Majesty's 6th Regiment at Colaba.	In 3 quarters of	1826	647	177	36·48
Poona.	In the year	1827	647	81	12·52
		1828	741	71	9·58
		1829	634	241	38·01
		1830	735	266	36·19

8. It hence appears that, by vigorous and well directed preventive measures, in aid of lock hospitals, venereal diseases were reduced in number and severity.

	From.			To.			From.	To.	
In the whole command.	1821	in	1826	661	in	1830	i. e. 54·5	17·1	Per cent. of the strength.
At Lock Hospital Stations.	1039	In 3 quarters of	1826	621	in	1830	71·8	21·42	
In Her Majesty's 20th Regiment.	567		1826	98	in	1830	72·17	1093	
In 2d do. do.	521		1826	70		1831	69·8	8·3	
In 6th do. do.	177		1826	71		1828	36·48	9·58	

9. In 1831, the number of police peons was reduced from six to two for each corps, their monthly pay from six to five rupees, the gratuity withdrawn, and the moocadums discharged. The few peons retained being now deprived of their accustomed reward, neglected their duty, loose women found their way back to the cantonments, and venereal diseases again increased.

	During that year			
	The strength was	Venereal admissions.	Rate per cent.	
In the whole command.	3778	992	26·25	i. e. 9 above 1830
At lock hospital stations.	2900	921	31·76	i. e. 10 ... ...

10. The 4th Light Dragoons at Kirkee in 1829 and 1830 employed a moocadum at eight, and six peons at six rupees each per month. In 1831 the former was discharged, and the latter reduced to two at five rupees each.

In	The strength was	Venereal Admissions.	Rate per cent.
1829 . .	617	117	19·
1830 . .	661	106	16·05
1831 . .	660	266	40·03

being twice and a half more in 1831 than in 1830.

11. Of the 40th regiment in

	The strength was	Venereal Admissions.	Rate per cent.
1830 at Belgaum, .	707	177	25.17
1831 at Poona, .	675	351	51.69

12. This increase appears to have stimulated to renewed efforts commanding officers of corps, who expended the regimental funds, most liberally and most beneficially, in the employment of additional peons. But these last being little known, distinguished by no badge, and exercising powers that might have been legally disputed, never attempted to follow suspected women beyond the regimental lines, at a short distance from which they met the men, setting all precautions at defiance. On the island of Colaba much of this intercourse could be prevented, and the Queen's 2d regiment of foot, stationed there in 1832, admitted only sixteen venereal cases from a strength of 503, being 3·18 per cent. At Belgaum, on the other hand, where it was more difficult to impede the approach of idle and dissolute women, the 20th regiment admitted 76 in 1831, 118 in 1832, the first being twice the number of admissions for 1830 in the same corps at Colaba. The venereal admissions into the 6th hospital at Colaba were reduced to 81 in 1827; and to 71 in 1828; yet, after the removal of that corps to Poona they amounted in 1829 to 241, and in 1830 to 266.

13.

	At lock hospital stations.			In the whole command.		
In	The strength was	Venereal Admissions.	Rate per cent.	The strength was	Venereal Admissions.	Rate per cent.
1831 .	2900	921	31·76	3778	992	26·25
1832 .	3868	780	27·2	3751	812	21·65
1833 .	2024	655	32·22	3573	757	20·07
1834 .	2088	436	20 88	3407	643	21·81
1835 .	2081	421	20·33	3402	663	19.29
1836 .	1700	413	24·29	3718	698	18·75

14. Lock hospitals and all other preventive measures in Bombay were abolished in December 1836. Venereal diseases have since progressively increased in number; and, in proportion to the strength, excepting only in the years 1840-42 and 43, during which the strength of the Queen's troops at Poona and Bel-

gaum, the most fertile hot beds of venereal pestilence, was reduced to less than one half its previous average, by the large proportion on field service, where they were comparatively little exposed to that detestable infliction.

15. Previously to 1832 the sick returns of the Queen's troops commenced on the 21st of the month. From that year on the 1st, and the annual returns which were originally dated from 21st December of one year to the 20th December of the next, corresponded with the civil year, betwixt 1832 and 1836, but have since commenced on the 1st April. The annual return, therefore, commencing 1st January 1836 terminated 31st March 1837, and comprised five quarters.

16. During the last eleven years. At Poona, Kirkee, and Belgaum, formerly

		Lock Hospital Stations.			In the whole Command.		
		The average strength.	Venereal admissions.	Rate per cent. per annum.	Average strength.	Venereal admissions.	Rate per cent. per annum.
1st Quarter	1837	2038	165	32·35	3335	208	23·56
Year ending 31st March.	1838	2051	646	31·01	3482	958	23·55
	1839	2085	727	34·91	4676	1096	23·44
	1840	1114	300	26·93	3899	597	15·35
	1841	2035	646	31·74	4391	940	21·41
	1842	1549	399	25·76	6009	1063	17·69
	1843	1983	550	27·74	6844	1260	18·41
	1844	2874	1046	36·40	6045	2034	33·64
	1845	2515	1003	39·80	5955	1770	29·72
	1846	2808	873	31·16	6020	1536	25·51
	1847	3127	1469	36·98	6854	2191	31.95
3 last Quarters.	1847	3923	1453	46·24	6090	1890	38·79
Aggregate,		*25784	9272	—	*59120	15542	...
Average,		2344	843	31·7	5375	1413	26·29

From this table it appears that the annual proportion of venereal diseases has been greater from 1st April 1847 to December last than in any year since 1826.

17. During the last twelve months, *i. e.*, from 1st April 1847 to 31st March 1848, of the Queen's troops serving

	The average strength has been	Average number sick.	Average number sick from Venereal disease.	Rate of Venereal sick to strength	Rate of Venereal to the whole sick.
At Kirkee, .	644	64	11	1·76	17·19
Poona, .	1991	196	55	2·76	28·06
Belgaum, .	1475	117	47	3·19	40·27
Colaba .	970	40	10	1·03	25·
Deesa, .	1464	57	17	1·16	29·82

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* This aggregate strength for eleven years contains only one fourth of the strength in the first quarter of 1837, and three fourths of that in the three last quarters of 1847.

	The average number has been	Average number sick.	Average number sick from Venereal disease.	Rate of Venereal sick to strength.	Rate of Venereal to the whole sick
At Kurrachee, .	1705	46	8	·47	17·39
Detachment, en route 15 weeks, .	433	30	4	·92	12·5
Total average, .	6412	521	143	2·25	27·45

18. In a letter dated "Military Department, No 3492, Bombay Castle, 3d August 1846," the secretary to government informs the adjutant general of the army, that the reason assigned for the abolition of lock hospitals was "simply their uselessness;" and that the late Dr Burke, Inspector General of Her Majesty's Hospitals, in a report addressed to the military secretary, Government of India, on the 21st March 1834 shows,

(1.) "That since the abolition of lock hospitals in Bengal the proportion of disease has continually decreased."

By an abstract of venereal disease in Her Majesty's regiments in Bengal, given in Dr Burke's letter, it appears that

"During the existence of the lock hospital system, viz. in the years 1827, 28, and 29, the proportion of venereals to strength was 30·1 per cent."

And that "since the abolition of the lock hospital system in the years 1830, 31, 32, and 33, the proportion of venereals to strength was 20·2 per cent."

19. By the accompanying return of venereal diseases in H. M's. regiments in Bombay for the last 22 years, and by the annual sick return for 1826, it appears that

During the existence of lock hospitals in Bombay from 1826 to 1836, the proportion of venereals to strength was 23·28 per cent.

And since their abolition from 1837 to 1847, the proportion was 26·29 per cent.

(2.) "That in the Bombay Presidency venereal complaints were less by at least two-thirds at stations without lock hospitals than at those where lock hospitals existed."

And the Bombay Medical Board have hence, according to Dr Burke, given and repeated an opinion, that "the lock hospitals under that presidency may safely be abolished."

20. But, with all deference to these high authorities, it appears to me that the preponderance of venereal diseases, at particular military stations, must have existed before the stations were selected from others for the foundation of lock hospitals, as it now exists eleven years after their abolition, and is therefore to be regarded as the cause, but in no sense as the effect or offspring of these institutions. During the existence, indeed, of lock hos-

pitals in Bombay venereal diseases were 17·95, and since their abolition, 20·49 per cent. more prevalent at lock hospital than at other stations.

From 1826 to 1836.

	The average strength was	The annual venereal admissions.	The rate per cent.
At lock hospital stations,	2292	666	29·06
At other stations, .	1152	138	11·11
Difference, . . .			17·95

From 1837 to 1847.

At stations where lock hospitals had been, .	2344	843	35·93
At other stations, .	3031	570	15·47
Difference, . .			20·49

(3.) "That, as the proportion of venereal affections in her Majesty's troops in the Bombay Presidency, with its lock hospital system, was greater by one-third than in Bengal, where no lock hospitals have existed for upwards of three years, the arguing advantages from the continuance of the lock hospital system in Bombay seems to be derived from impressions and sources not affording conviction from the force of facts."

21. The difference in the degree of prevalence of venereal diseases has been equally great at different stations in Bombay, both during the existence and since the abolition of lock hospitals. If venereal diseases were one-third more prevalent with lock hospitals in Bombay than without them in Bengal in 1833, they were more prevalent in Bombay in 1847, eleven years after the abolition of lock hospitals, than during any year of their existence since 1826, that year which preceded the introduction of preventive aids, indispensable to their success.

(4.) "In Bengal, on the 31st August 1833, the average strength of her Majesty's troops was . 1514
The number of venereal cases in hospital, . 60
The rate per cent. . . ·8"

22. In Bombay, on the 31st August 1833, | On the 29th April 1848.

	In Bombay, on the 31st August 1833,	On the 29th April 1848.
The average strength of her Majesty's troops was	3539	6415
The number of venereal cases in hospital, .	42	135
The rate per cent. .	1·2	2·1

or ·9 per cent. higher 11 years after the abolition of lock hospitals, than at the date selected by Dr Burke while they existed. The causes which multiply venereal diseases, and facilities for preventing or curing them, may be very various in three presidencies, as well as at the different stations of e There are in Bombay neither remedies of presumed efficacy in cure of venereal diseases known to the natives, as in Bengal, old bawds to the uninterrupted exercise of whose superintenc care of the females entrusted to them, Dr Burke seems to att so much importance, as a protection to the health of the tro there.

(5.) According to Dr Burke, the proportion of vene diseases was greater in Bombay, after the appointment of po peons in 1831, than previously in 1826; but he arrives at conclusion by comparing the proportion that occurred in 6 mo of 1826, with the proportion that occurred in the whole yea 1831, the first being 36·9, the second 38·5.

23. Now if we double 36·9, we find the *annual* propor in 1826 to be 73·8—*i. e.* 35·3 per cent. higher, instead of lower than in 1831. Nor is this all. To illustrate the ineffici of police peons, Dr Burke has selected the very year in w their powers were paralyzed by a reduction of two-thirds in number, and one-sixth of their pay. If he had taken, as an ample, one of the three years they were in full force and acti his own table would have given 21.4 per cent. as the proporti admissions to strength in 1830, being 52·4 per cent. less th 1826.

24. The following recapitulation gives an abridged view o extent to which venereal diseases have prevailed in the Qu forces serving in this presidency during the last 22 years :—

	At Lock Hospital Stations.				In the whole comma		
	The average strength was		Average annual admissions.	Ratio per cent.	The average strength.	Average annual admissions.	R per
			During the existence of the Lock Hospitals				
In 1826	1537		1093	71·11	2973	1621	5
1827	2086		868	41·61	3361	996	
1830	2971		621	20·9	3818	661	
1828 to 30, 3 years	2639	Annual average.	580	21·98	3567	652	1
1831 to 36, 6 years	2778		604	26·11	3605	761	2
1827 to 36, 10 years	2367		623	26·32	3569	752	21
1826 to 36, 11 years	2292		666	29·15	3453	804	23

In	At Lock Hospital Stations.				In the whole command.		
	The average strength was		Average annual admissions.	Ratio per cent.	The average strength.	Average annual admissions.	Ratio per cent,
					Since the abolition of Lock Hospitals.		
1837 to 47 11 years	2344	An. aver.	843	31.7	5375	1413	26·29
During the whole period embraced by the returns—							
1826 to 47, 22 years	2318	An. aver.	755	32·51	4404	1109	25·15

25. It has been already remarked that the annual proportion of venereal diseases was greater from 1st April to 31st December last, than in any year since 1826. Their average proportion was above one-fourth of the whole number sick in hospital during the year ending 31st March last. They have deprived government for days and weeks annually since 1826 of the services of 1109 European soldiers, and permanently during last year of the services of 143. But these large numbers do not exhibit the whole mischief inflicted by them; for the ruined health and inefficiency of a considerable proportion of invalids, and of men admitted under other heads, may be traced to attacks of venereal disease, and to the hospital confinement, discipline, and treatment required for their cure.

26. That lock hospitals did not accomplish the objects for which they were established, during the whole of their existence in Bombay, is no proof that they are incapable of doing so, with the conditions dispensable to their success. These conditions are the employment of agents, in sufficient number for the detection of venereal diseases in prostitutes, and the compulsory seclusion and medical treatment, until restored to health, of every detected case. The very remarkable success which attended such preventive measures betwixt 1827 and 1830—four years only out of the eleven during which lock hospitals existed—in the whole command, at lock hospital stations, and in particular corps, has been already pointed out.

27. After a careful and patient examination of the question in all its bearings, my deliberate opinion is, that lock hospitals, though of very great use, during a few years of their existence in Bombay, might have been made, with proper aids, permanently and greatly more useful, and that their re-establishment for the compulsory seclusion and cure of prostitutes, labouring under venereal diseases, together with the organization of a police force and health officers for the apprehension and examination of suspected cases, are now urgently required, and are the measures most likely to succeed in preserving the health and efficiency of the Queen's troops, heretofore and now so very seriously impaired by the extraordinary prevalence of that class of diseases, at every important military station in the command.

Art II.—*Cases of Ichthyosis L., and Hirsuties.* By Willia Pickells, A.B., M.D., one of the Physicians to the Feve Hospital, Cork.

It is now a lapse of years since the cases above alluded to cam under my observation. The many epidemics, some of them ur paralleled in the history of the country, which unfortunately visite this city during the eventful intervening period, allowed me mo particularly, from my connection with the fever hospital, little le sure or inclination for writing. Lately, on looking over my note it occurred to me that by putting them together the cases mig be worth communicating.

1. The first which I shall notice is one of *Ichthyosis*, whi occurred in the person of a young female, aged sixteen, of dece and rather comfortable connections, whom I shall designate by t feigned initials of M. S. She was received into the fever hospit as affected with fever on the 21st of May 1829, having remaine under medical treatment thirteen days previously sick at home.

On the 22d May, the day after admission, she is noted in t case-book as "covered with horny scales on knees, thighs, and pa of the abdomen." Upon more particular examination and inqui as the case proceeded, it appeared that the greater portions of t lower region of the abdomen and the extremities were envelope in horny excrescences of a dark brown or black colour; in som places flat, scaly, and imbricated; in others wart-like but fou sided, or rhomb-shaped, standing at right angles to the skin, an so close set as to form a continuous, as it were tesselated structure or texture, not rising, however, more than about one-eight of an inch above the skin. They were most prominent and regular in their arrangement on and from the knees upwards toward the hips; from the hips extending backwards to and traversin the nates. Over the knees, on the patellæ, the structure was ver striking and peculiar, forming, as it were, a defence for the joints. From the knees downwards they gradually declined towards the feet, with the exception of the insteps, on which they were again prominent and close set. On the soles of the feet there were none. Above, they gradually declined towards the mammæ, becoming flatter until lost in the natural integument. The mammæ were free. The neck and face were also free. The palms of the hands, though as well as the soles of the feet exempt, were rougher than they ought to be for one that was not accustomed to hard labour. There was a roughness also on the arms and on the back, as well as on the outer part of the thighs. The scaly covering or formation bore on the whole (such was the impression on all that saw it) considerable resemblance to the skin on the back of the sole fish, particularly when boiled.

Clothed in her ordinary dress, and mixing in every day life, her face which was very handsome, and neck only appearing to view, she might have passed as the last person to be suspected of labouring under so unsightly a malady. Contrasting in the mind the beauty (so far as met the eye) of her appearance above, with the deformity of the lower extremities, one could not help applying the line of Horace, descriptive of the mermaid, or siren :

> ——————Turpiter atrum
> Desinit in piscem, mulier formosa superne!

Her fever while in the hospital partook more of the character of synochus than of typhus. There was no petechial efflorescence. Headach and eyes suffused indicated determination to the head, but the mental faculties were quite clear. For some days there was excessive thirst; much tremor is also noted. There was pain of the right hypochondrium, on pressure, with bilious dejections (green). The symptom the most remarkable was an obstinate tympanitic enormous swelling of the abdomen, which, however, was at length brought down by a course of purgatives. In about a week after admission gangrenous symptoms supervened, first of the right ear, and afterwards of the hips and *os sacrum.* For these, after leaving the hospital free from fever, she continued to be treated during some time at her own house by one of the surgeons of the dispensary.

While in the hospital I learned from her the following particulars of her history. The cutaneous affection came on when she was about two months old. She is one of six children, two brothers and four sisters, of which number a brother and sister, who are at present in America, have it in a worse degree than she; it (with the exception of the face and hands) covering the whole body. Her two other sisters, who are at present in Cork, have very fair skins. What she thinks very extraordinary is, that her father has been always free from the disease, though her grandfather (by the father's side, who died shortly after at the age of ninety-four) has it (face and hands excepted) on the whole body, it extending even to the inside of the wrists. He was born so, and it never left him. He never perspired. Had a fever at one time, but did not perspire in it. Had a remarkable redness of the face.* His hair was, as is hers, brown. She experiences no material inconvenience from the horny rigidity in the motion of the muscles and joints. Can turn in the bed. No rustling of the knees while walking. The eruption does not itch. In those parts where thickest it was wont to bleed, if torn off, and cause pain. On the legs it may be scraped off with a knife without causing pain, coming off there in scales. She tried, in three successive years, to bathe in the salt water, but was obliged to desist, the pain was so great. She never perspired. The hottest day in the year if she walked out she used to have a sense of pins and needles, but did not perspire. There was no diaphoresis while in fever in the hospital. Other functions are regular, catamenia and urinary secretion. She had been inoculated repeatedly in her childhood by a regular practitioner for small-pox, but never took the infection. Seven years since, while in America, where some of her family are settled, she had scarlet fever, and afterwards jaundice and yellow fever, having been sick of these different diseases during eight weeks. Previous to going to America she had had the fever of this country, with spots (petechiæ) on the skin. Was insensible in it for three weeks.

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* In the second account of Edward Lambert, published in the Philosophical Transactions, he is described as, "a good-looking well-shaped man, of a *florid* countenance, and when his body and hands are covered, seems nothing different from other people."

September 4. She called at my house to return thanks. The excrescences, she said, with the exception of a very few on the knees, had totally disappeared, having scaled off. She was [illegible] under treatment for the gangrenous sores by the dispensary surgeon.

I saw her again in July of following year (1830). She has had some return since of ichthyosis, which also affected her face; from this, however, the eruption was going off, as I saw like dandruff, attended, she said, with a smarting or stinging sensation. The eruption did not materially affect her good looks, as she appeared healthy and blooming. Had been seven or eight months without return of ichthyosis. It returned in May. Continually perspiring at the present time.

I heard of her last in the following November, from one of the hospital nurses, who used to visit her once weekly. She informed me, that, in about a fortnight after I saw her in July, the eruption went off, and that her skin has been quite clear ever since.

The purgatives above alluded to, as given in the treatment [illegible] her case while in the hospital, consisted of powders of calomel and compound powder of rhubarb combined; of the former ten grains, of the latter twenty, followed at intervals with doses of *Olei Ricini, Ol. Terebinth. āā* ℥i, *e aquæ puræ,* ℥iss. The long-continued discharge from the gangrenous sores contributed probably much towards the removal of ichthyosis. A portion of the lobe of the right ear sloughed off.

2. Previously to the occurrence of the case now detailed, I had seen that of a boy of thirteen or fourteen, named Gainer, which was particularly remarkable, inasmuch as the palms of the hands and soles of the feet were affected. Upon taking his hand to feel his pulse, I was struck, startled indeed, by the appearance of the palm, covered with brown, rugged horny excrescences, conveying rather the idea of the hoof of a quadruped than of the human hand.

The palm of the other hand, I found on examination, was similarly affected, as were also the soles of the feet. Over the knee-joints, on the patellæ, the coating was so thick and hard as to represent a sort of knee armour. The intensity of the eruption on particular parts contrasted strongly with the immunity of the rest of the body, which was almost free. He was a healthy looking boy. His fever was slight. Said that other children of the family were affected in the same way, and that they were born so (connate).

3. In another instance, also, which occurred subsequently, that of a man whom I did not see, not having been under my charge, the palms of the hands, I learned, were similarly encrusted. The soles of the feet were not examined. The case has been reported to me by an intelligent servant of the hospital, then a grown boy. Passing through one of the wards, the man's shoulder being uncovered, he was struck by the appearance of the skin, particularly on the acromion, looking, he thought, like the skin of a hake. Remarking on the appearance with surprise to the nurse, she said "he was a scaly man." Observing next the palms of his hands blue (he was a weaver by trade, and his hands had become blue in the exercise of his art), he asked him why he did not clean his hands. He said he could not; that all he could do would not make them look clean ; but that at a particular season of the year, the scales (though afterwards replaced), then coming off (shedding or moulting), they were less discoloured and smoother than at other times. The eruption was on his wrists, too, all around. Further my informant did not examine. This case, as well as that of Gainer's, is particularly remarkable, as the cases of a mother and child by Mr Cline in vol. ninth of Medico-Chirurgical Transactions, and another cited by Willan, that of a boy who was exhibited at the Hague in 1683, "whose hands and feet were all scaly, the rest of the body, except the head, being covered with a substance like the skin of the seal," are the only recorded instances I have met with, in which the palms of the hands and soles of the feet, though in some cases rougher than they ought to be, are stated to have been affected.

4. In 1834, a poor woman, an idiot, died of cholera after a short illness in the cholera ward, whose abdomen and thighs were, as reported to me by the nurses, affected with ichthyosis.

5. The last case which I saw was in July 1841, that of a lad of 18 years of age, named Kidney. His whole body, more particularly over the knee-joints, was covered with ichthyosis of a dusky brown hue. He never perspired. Said his mother's brother was subject to the disease, implying that his father and mother were not. This case, then, is remarkable, inasmuch as the taint did not manifest

itself in the direct ancestor, but in a collateral. In Mr Cli[illegible]e cases, the taint was inherited directly from the mother by the child a girl.

The rarity of the occurrence of cases of ichthyosis may be inferred from the fact, that of the thousands of patients who have been from time to time stripped and examined on admission into the hospital, these were the only cases that presented themselves.

6. Not long after the termination of the case of M. S., a person was exhibited in this city for money, under the denomination of "The Porcupine Man covered," it was said in the handbills, "with scales, representing the skin of the rhinoceros." The skin of the rhinoceros, according to some naturalists, is so hard as to be proof against a musquet ball. Upon visiting him, I saw that his face, the palms of his hands, and the soles of his feet, were smooth like those of other men, but that the entire surface of the rest of his body appeared to be covered with, or encased, as it were, in a mass of excrescences of horny or semi-horny matter, of a dusky brown colour; in some places flat and scaly, in others, prominent and wart like; cylindrical in figure; rising about half of an inch in height above the skin, standing at right angles to it, and so stiff and elastic that when ruffled by the finger, the noise might have been heard at a considerable distance;—suggesting, it seems, to the minds of some persons, the comparison of the rustling of the bristles or quills of the hedgehog.

He cast, he said, the horny matter twice every year, particularly in winter, and that the horny warts, tubercles he called them, were then an inch in length. It was now summer.* He cut off one of the tubercles quite close to the skin, to show to me that differently from warts no blood was drawn in consequence. Could bear the application of a lighted candle to the surface, particularly to the olecranon, a considerable time without feeling pain. He burned off a portion of the surface in my presence without feeling, he said, pain. He seemed rather an intelligent sort of person, and to have acquired some just notions on the subject of the pathology of his disease, remarking on the affinity of horn to nail, as well as to epidermis and hair. He said there were hairs where the horny matter was, but that they could not be seen. Upon my telling him that I had lately seen in one of the hospitals of the city a case in which the palms of both hands were incrusted with horny excrescences similar to those on him, he seemed to doubt it much, asking, were they at right angles to the skin?

He had visited, he said, several of the principal cities of Europe, and he had been examined, among others, by Cuvier.

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* This casting the horny matter annually, as the lobster casts its crust or shell, occurred, too, it will have been perceived, in the instance of the weaver above mentioned.

The eruption first showed itself at about two months from birth. His father, grandfather, and great-grandfather, had been similarly affected. He was a native, he said, of Davies' Straits, (meaning of course that the first of his ancestors came from that quarter), where there was a whole tribe similarly affected. He said he was thirty-five years of age.

This man was evidently the descendant of Edward Lambert who was presented to the Royal Society in 1736, and whose case, as published in the Philosophical Transactions, has been above alluded to. He was probably the person who, much about the same time (see Lancet, April 27th 1833), presented himself to the members of the Westminster Society, having a similar condition of skin, and claiming the same hyperborean origin. Comparing dates, he must have been son to one of two brothers, grandsons to Edward Lambert, who were shown in Germany many years before, and of the accounts of whom, by Dr W. G. Tilesius, and by Blumenbach, an abstract has been published by Mr Lawrence.

The story of the first of the Lambert family having been found by the captain of a whaler in a savage state in the wilds of Davies' Straits, where was a whole tribe similarly covered, and (christened in the captain's name, Edward Lambert), having been ultimately brought to England, has been latterly treated as fabulous,—got up to excite the greater curiosity and wonder, by throwing an air of marvellous over the circumstances of his birth, in deducing it from that strange and inaccessible region.

Some years since I recollect a man was shown in this city for money, who was stated to be a native of Timbuctoo, in the interior of Africa, and who could gainsay it? The possibility of the existence of a tribe such as that mentioned cannot, however, be denied. Mr Lawrence was of opinion that a pair, in which both parties were so distinguished, might be the progenitors of a new variety of the race, which would be thus marked in all future time.

In every instance I have met with, a few excepted, in which it was yellow or yellowish, the colour of the integument in ichthyosis has been either a shade of brown or black. In the instance of another individual of the Lambert family, who presented himself at the Westminster Hospital in 1834, it was *green*. I take the account from a newspaper (Cork S. Repr., February 6, 1834) extract from the London Medical and Surgical Journal of that date.

" He is completely covered with a green horny substance, in the form of quills, not dissimilar to those which are produced in the porcupine. The parts which have escaped the deformity are his face, the palms of his hands, and soles of his feet; every other part of his person is abundantly supplied with this green horny substance. He sheds his horns or quills annually, and a fresh crop succeeds. He has been thus afflicted since his earliest infancy; and all the male members of his family, down from the great grandfather, have been similarly well furnished. Is a middle-aged man, of very athletic and robust form of body; his general health excellent, and his secretions very regular." The above statement of the line of descent agrees with Dr Elliotson's account of the statement, in this respect, of an individual of the Lambert family who had been exhibited in Bond Street. "The disease," he stated, "was transmitted to every male, without exception, in the male line, but had never appeared in the females or their male offspring."

The instance, however, of the family of M. S. proves that ichthyosis does not always, in its hereditary transmission, privilege or spare the female sex; as also, that, like other hereditary diseases, it may cease in one generation to be transmitted to the next,—her father having been free himself, while of six children, three (two of them females), were affected.

The appearance of the skin in ichthyosis, though in general bearing considerable resemblance to that of a fish, whence the term ichthyosis, has, as seen and described by different observers, given scope to a variety of similes taken from other parts of the creation, one comparing it to the bark of a tree, particularly to that of the elm; another to the skin or hide of the rhinoceros, particularly about the legs (the skin of the rhinoceros is of a dusky brown); another, (Blumenbach), to the skin of the elephant, especially about the vertex and forehead; another to the armour of the armadillo. Among amphibia, it has been compared to the skin of the seal; and in the instance of the individual who presented himself at the Westminster Hospital, some observer of lively imagination might have compared it to the skin of the crocodile "coated in green scales." To the Lambert family seems to belong exclusively, in published works, the designation of the Porcupine Men and the Porcupine Family.

Prichard, in his Researches into the Natural History of Man, in concluding that there is no original difference between the skin of the European and that of other races of men, which gives reason to imagine a diversity of species in mankind, refers to the history of the porcupine family, as affording a curious illustration of the anomalies, which display themselves external to the true skin, and of the wide range of variation to which these external coatings of the human body, as well as the corresponding parts in the inferior animals are subject. In advocating, in the course of his work, the doctrine of the unity of the human species, he has produced, from particular tribes of the human family, instances of variation of colour, from white to black, and from black to white, or of both complexions subsisting in the undoubted progeny of the same stock.

To other facts adduced in support of this view of the question may be added the following, which I casually met with, stated to have been taken from an old writer, Mizaldus, who flourished about three centuries since. "Children are not always like unto their parents, as may appear in Holides, which did beget a daughter of an Ethiopian, which daughter was not of the colour of her mother; but afterwards the said daughter had a son which was black, and like to his grandmother. So Niseus the poet did degenerate in his colour from his father and his mother, and was like his grandfather, being an Ethiopian; which thing ought well to be considered of such as suspect their wives when they bring forth children unlike to either of them."

The species of ichthyosis which has been now considered is that of *Simplex*, as contradistinguished by nosologists from *cornea,* in which horn-like projections, in some instances of considerable length, issue from different parts of the body, mostly from the head; but, in other instances, from some singularly odd part, as from the thigh, immediately over the great trochanter, the posterior part of the leg, the buttocks, &c.; the abnormal deviation or deformity being such, as that those who have had the misfortune to be afflicted with it have been regarded as monsters. Sir Everard Home, in his paper in the Philosophical Transactions (vol. lxxxi.) is of opinion that these horns, which, in instances on record, have attained to the length of a foot, or nearly a foot, "are very closely allied to nails, both in their growth, structure, and external appearance; and when of some length, they are so brittle as to break in two upon being roughly handled, which could not happen to hoof or horn."

In their forms they present the most grotesque variety; in some instances inflected and contorted like a ram's horn, in others crooked like a sabre. On a minor scale, they have shot out at the extremities of the fingers or toes to the length of two or three inches, not straight, but incurvated like turkeys' claws, or the talons of birds of prey. They are sometimes shed and reproduced periodically.

Clarke, the ossified man, who was a native of this county, and whose skeleton, regarded as the finest specimen of exuberant ossification extant, is preserved in the anatomical theatre of Dublin College, had always, it is stated, a bony excrescence issuing out of his left heel, which sometimes grew to the length of about two inches; and when it shed, as a deer does its horns, it still continued to sprout as before. A knife and fork, or knives and forks, the handles of which were made from this bony spur-like deci-

[illegible]

[illegible]

[illegible] He was [illegible] of age. His [illegible] [illegible] after a few days.

[illegible] which [illegible] from [illegible] in the [illegible] "As connected with this department may be mentioned," says Mr Crawfurd, "the existence of a man at Ava, covered from head to foot with hair, whose history is not less remarkable than that of the celebrated porcupine man, who excited so much curiosity in England and other parts of Europe about a century ago. The hair of the face of this singular being [illegible] is shaggy, and about eight inches long: on the breast and shoulders it is from four to five. He is a native of the Shan country or Laos. He was presented to the King of Ava as a curiosity by the prince of that country. At Ava he married a Burmese woman, by whom he has two daughters: the elder resembles the mother, the younger is covered with hair like the father, only that it is white or fair, as, his is now brown or black, however, being fair when a child like that of the infant. It is singular that in the father the teeth are defective in number, the molares or grinders being entirely wanting."

3. Instances are to be found, according to Prichard, of races bearing an exuberant growth of hair. "Among the Ainos, or in the Kurilian race, there are individuals who have hair growing down the back and covering the whole body;" though, he observes, it is probable that none of these national diversities exceed that measure of variety which occurs in the same nation in different families.

It is an opinion which has been long received that much hair or hairiness is indicative of strength. Swayed, it would seem, by this opinion, some physiologists have deprecated the customs of shaving the beard, and of cutting the hair of the head, as tending to weaken the powers of the body and mind. Bichat attributes the superior strength of the ancients to the custom of wearing their beards. The opinion is, however, combated by Bell in his Anatomy, from the observation of famous boxers being smooth, while dark and sallow people are hairy. In this point of view, the recent discovery of a wild man in the woods of Arcansas in North America, in which, it would appear, he has been living a considerable number of years, cannot fail to arrest the attention of the physiologist and metaphysician. He is described as "being of gigantic stature, the body covered with hair, and the head with long locks that fairly envelope his neck and shoulders." It is supposed that, having survived the earthquake disaster which occurred in 1811, and having been thrown by it helpless on the wilderness, the wretched derelict grew up in his savage state, until, as last seen, he now bears only the outward semblance of humanity.

The preceding paper having related to hereditary or transmissible diseases, it may not be out of place to add a few words on those pecularities of certain families, and even of whole tribes, and of whole nations, marked by inability to pronounce particular letters of the alphabet. Whole families cannot pronounce the letter R. I knew an instance of the existence of the peculiarity in a member of a family to whom it had been communicated by intermarriage with another family who had been remarkable for it. The author of the article "Luette" in the Dictionnaire des Sciences Medicales, says that those who are deprived of the uvula cannot pronounce R. An eminent surgeon of this city told me, however, that he asked the question of a former patient of his who had lost it by syphilis, and that he said, he did not experience the inability. Mitford, in his History of Greece, speaking of Methone, says in a note (vol I., p. 214) "Pausanias writes this

this name Mothone, and among the Greeks it so remains to this day; but the Italians, unable to pronounce the Greek ϑ, speak and write it Modon; the French, for the same reason, call it Modon. Humboldt in his Personal Narrative, vol. vii., has a note, in which he cites Navarette as saying "the etymology of the word Cannibal seems to me entirely cleared up by the discovery of the journal kept by Colon during his first voyage of discovery, and of which Bartholomew De La Casas has left us an abridged copy. "Dice mas el Almirante, que en las islas passadas estaban con gran temor de carrib, y en algunas, los llamaban caniba, pero en la Espanola, carib, y son gente arriscata, pues andan per todas estas islas, y comen la gente que pueden haber." Humboldt in commenting on this passage observes, "In this primitive form of words, it is easy to perceive that the permutation of the letters R and N, an effect of the imperfection of the organs in some nations, might change carib into canib, or caniba." The word Shibboleth, now naturalized in the English language, was originally used among the Hebrews, as making a criterion by which the Ephraimites were distinguished from the Gileadites; the Ephraimites being unable to pronounce the ש, pronounced the word Sibboleth.*

ART. III.—*Remarks on a pretended distinction of* AMAUROSIS *into functional and organic.* By WILLIAM MACKENZIE, M.D., Surgeon-Oculist in Scotland in Ordinary to the Queen.

§ 1. *Origin and object of the following remarks.*

IN the course of a long experience in the treatment of eye-diseases, I have often been asked the question by patients affected with AMAUROSIS, or by their medical attendants with whom I was called to consult, whether, in the particular case before me at the time, I considered the disease to be *functional* or *organic*. As far as I recollect, I have never returned any answer to this question, because I did not understand the meaning of the terms, and, in particular, could assign no proper signification to the word *functional* so applied. I have often reflected, however, on the meaning which must be attached to the terms *functional* and *organic*, by those who use them under such circumstances; and shall now proceed to give the result of my thoughts on the subject.

§ 2. *Explanation of terms.*

As it is possible that the confusion which seems to attach itself to the notions of those who speak of amaurosis as being sometimes a *functional*, sometimes an *organic disease*, may be owing in a great measure to the ambiguity of words, which has long been admitted to be one of the greatest impediments to the advancement of knowledge, I shall set out by defining these terms.

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* Judges, Chapter xii., verse 6.

1. *Function—functional. Function* (Lat. *functio,* from *fungor,* to perform an office or duty), signifies the executing, or discharging of an office. Digestion, in this sense, is the function of the stomach; circulation the function of the heart and blood-vessels; vision the function of the eye. Function, then, is nearly synonymous with *power*—δύναμις.

Functional signifies of or belonging to a function and is synonymous with *dynamic.*

2. *Organ—organic. Organ* (Gr. ὄργανον) signifies an instrument, machine, or engine—something which performs a certain work or office. The stomach is the organ of digestion; the heart and blood-vessels the organs of the circulation; the eye the organ of vision. Organ, then, is nearly synonymous with *structure.*

Organic signifies of or belonging to the organs, or *structural.*

What can be more plain than this, that the functions of the body are the offices or duties to be performed or executed by the organs of the body; that the organs of the body are the instruments which perform or execute the functions; that no function can be performed without an organ; that no organ can be without a function?

The functions of the body are not executed by solid parts alone, but also by fluids. Only a small portion of the body is solid; by far the greater portion is fluid. Whether combined with the solid parts, as in the nervous substance; or flowing through the body, as in the blood; the fluids form organs or parts of organs, and suffer changes,—organic changes,—from morbific causes as well as the solids. The blood has a structure as regular as the most solid texture in the body, and as surely susceptible of organic change from disease.

3. *Disease.* (Gr. Πάθημα, Πάθος, Νόσος—Lat. *Morbus, Vitium, Aegrotatio.*) Little information is to be gained by referring to the etymology of the words employed in different languages to signify disease. Πάθημα and πάθος, from πάσχω, signified *whatever one suffered,* or *was affected with,* bodily or mentally. Νόσος and *morbus* are original words which we cannot trace. *Morbus* differed in signification from *vitium,* which we generally translate *deformity,* in as much as the latter is permanent, the former temporary. *Æger,* an original word signifying *weak, sick, ill,* gave rise to ægrotatio, *bodily sickness,* and ægritudo, *discomfort of mind.* (Sed proprié ut ægrotatio in corpore, sic ægritudo in animo nomen habet. *Cic.*) *Morbus* appears to have had such a meaning as *disease* generally has; *ægrotatio* to have signified a less serious *complaint.* (Morbus appellant totius corporis corruptionem; ægrotationem, morbum cum imbecilitate.—*Cic.*) *Disease* literally

signifies no more than the absence of ease, being compounded of ease, (Fr. *aise*), and the inseparable particle *dis*, (Lat. *di* or *dis*- Gr. διὰ) which has a privative or negative signification.

I presume we need not seek for any other definition of disease than that of Galen. It seems perfectly clear and correct:—" Disease is an unnatural state of the body, causing a disturbance of the functions."[*] According to this definition all diseases are organic. One or several of the organs are in an unnatural state, and the functions performed by these organs are disturbed or have ceased. This view of the matter is conformable to a first principle which I conceive it is impossible to overturn, namely, that the functions of life in all instances, whether of health or of disease, bear an exact ratio to the condition of the organs.

§ 3. *Inadmissibility of the distinction, functional and organic.*

That some diseases are functional, and that other diseases are organic, is a proposition which cannot be admitted; for, however much the effects may be manifested in the functions, the seat of the disease must be in the organs.

No cause, capable of exciting disease, can act upon a function, but only upon an organ or organs; nor can any change constituting a disease exist in a function but only in an organ.

Those who speak of functional diseases may have some association of ideas in their minds by which their language, which seems jargon to others, becomes to them intelligible. He who uses the phrase "functional disease," may figure to himself an increased or diminished, a perverted or abolished action or function; but surely it is impossible he can for a moment suppose such a state to be independent of some change in the parts whose duty it is to fulfil the function—a transient or removable change, a permanent or irremovable one—but still, in fact, an organic change.

To speak of a functional disease seems to be as absurd as if one were to assert that the orbit of the earth could be affected by the attractive force of the heavenly bodies. These undoubtedly act on the earth, and affect its course; and so may morbific causes affect the body, and derange its functions. But a functional derangement, independent of some organic change, can no more take place than a deviation in the earth's orbit, independently of causes acting on the earth itself. The functions of the human frame may be deranged; but nothing can produce this effect, except through the medium of the organs which perform the functions. A physician setting to work to speculate on the causes which might directly disturb the functions of the body would plunge into a set of errors as gross as those which the astronomer would encounter, who should begin to speculate on causes capable directly of affecting the figure of the earth's orbit.

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[*] Ergo dictum est, morbum esse corporis statum quendam præter naturam, a quo actio læditur primum. De Symptomatum Differentiis, cap. i.

I conceive, therefore, that those who have introduced the phrase "functional disease" have invented merely an unphilosophical and absurd way of speaking.

§ 4. *Necessary to refer to the writings of the Functionalists.*

As to those unacquainted with the subject, it may perhaps seem impossible, that any authors can have adopted such a division of diseases as that of functional and organic, it will be necessary to bring forward examples of the fact; and to draw from the writings of the functionalists, some illustrations of the strange results arising from the admission of the class of functional diseases. In doing this, we may have occasion to touch upon a variety of topics, having no other connection with amaurosis than this, that, as opportunity is but seldom afforded for an examination after death of the causes of this disease, we are obliged to ground our reasonings regarding it very much on the analogy of the organic changes which we observe in other parts of the body than those affected in amaurosis, and especially in other parts of the nervous system, and to endeavour to discover whether it is not ascribable to similar causes.

§ 5. *Dr Charles J. B. Williams, a functionalist.*

In the introductory lecture prefixed to his Principles of Medicine, London 1843, p. xxiv., Dr Williams speaks of disease as a "condition consisting of altered function and structure." If altered function is to be mentioned in the definition of disease, it ought to be placed after altered structure. A condition consisting of altered structure being admitted to exist, altered function must follow; although there may be cases in which it is difficult to point out the connection between the two; and although we may in certain instances recognise only the alteration of function without being able to point to the alteration of structure, and *vice versa.*

At page 2, Dr Williams states, that "health consists in a natural and proper condition and proportion in the functions and structures of the several parts of which the body is composed. From physiology we learn," says he, "that these functions and structures have to each other and to external agents certain relations, which are most conducive to their well-being and permanency; these constitute the condition of health. But the same knowledge also implies that function and structure may be in states not conducive to their permanency and well-being; states which disturb the due balance between the several properties or parts of the animal frame; and these states are those of *disease.* For example, physiology, as well as experience, teaches us, that in health the digestion of the food is easy and without annoyance. But when after food is taken, there is pain, sickness, eructation, flatulence, or the like, we know that the *function* of digestion is changed from the healthy standard—is *diseased*; and if this diseased function continues long in spite of remedies which usually correct it—and if on examining the abdomen we find at or near the epigastrium a hard tumour, which anatomy teaches us is not there in health, we know that there is also *diseased structure*."

In this general enunciation of the doctrine of functional and structural or organic disease, it is evident, in the first place, that the supposition, that pain, sickness, eructation, and flatulence are unconnected with any structural or organic affection of the stomach, is unsupported by the smallest particle of proof; and secondly, that another gratuitous supposition is admitted, still less likely to be true, if not altogether absurd, namely, that stomachic remedies correct a diseased function, just as if a function, whether healthy or disordered, were a substantive entity, acting independently and for itself, and not the mere duty performed by certain parts of the body.

It is curious to observe, that though the minds of the functionalists are warped in the most extraordinary manner by the doctrine which they have embraced, and of which the above extract from Dr Williams affords a pretty fair example, they are unable to shut their eyes altogether to certain glimmerings of the truth, which occasionally break forth amid their pathological dogmata, and which evidently lead them to doubt the authority, and sometimes to qualify the expression, of their first principles.

Thus, Dr Williams goes on to say, " We find, then, that there is *disease of function*, known by its deviation from a standard furnished by *physiology;* and *disease of structure* which we recognise by a standard supplied by *anatomy.* These varieties of disease," adds he, " may be, and very commonly are, combined. There is seldom structural disease without some disorder of function ; and in many instances functional disease is, or will be, accompanied by change of structure." This admission, similar to others which we meet with in other authors, approaches to an abandonment of the distinction of functional and structural diseases, and verges to the truth, that all diseases must be both structural and functional, the structural change being the primary one, and the functional secondary.

Dr Williams, in the extract quoted from page 2, mentions the usual symptoms of dyspepsia, as those belonging to a functional disease. Several authors, as Abercrombie, Parker, and Dick, relate cases of severe dyspepsia, in which no morbid changes were observed in the stomach after death. Even were the anatomical investigations in such cases commenced at a sufficiently early period after death, conducted with very great care, and aided by the microscope, it would be a hasty conclusion, to infer that there were no structural changes present, because no very evident ones were detected. The aspect of the mucous membrane of the stomach, and even the forms of the gastric glands, and of their vesicular contents, may seem normal, and yet their intimate structure be changed, and their functions consequently impaired. We know from Dr Beaumont's inspections of the living stomach, (in Alexis St Martin, a young man who had recovered from a gun-shot wound, which carried away part of the integuments and muscles of the left side and perforated the stomach), that the interior of this organ exhibits the most unequivocal signs of disease during attacks of dyspepsia,—signs, however, which it is conceivable might be scarcely, if at all, recognizable after death.

Dr Beaumont states that when it is empty, the rugæ of the stomach appear irregularly folded upon each other, almost in a quiescent state, of a pale pink colour, and with the surface merely lubricated with mucus; that on the introduction of aliment the action of the vessels is increased, the colour brightened, and vermicular motions excited; that the small gastric papillæ begin to discharge the gastric juice, a clear transparent fluid, and that this continues abundantly to accumulate as food is received for digestion. He found that if the mucous covering of the villous coat be wiped off with a sponge or handkerchief, during the period of chymification, the membrane appears roughish, of a deep pink colour at first; but in a few seconds the follicles and fine papillæ begin to pour out their respective fluids, which being diffused over the parts abraded of mucus, restore to them their peculiar soft and velvet-like coat, and pale pink colour, corresponding with the undisturbed portions of the membrane; and the gastric juice goes on accumulating and trickles down the sides of the stomach.

If the mucous covering be wiped off when the stomach is empty, or during the period of fasting, a similar roughness and deepened colour appear, though in a less degree; and the mucous exudation is more slowly restored. The follicles appear to swell more gradually. The fluids do not accumulate in quantity sufficient to trickle down as during the time of chymification. The mucous covering only appears to be restored.

So much for the appearances of the internal surface of the stomach in health.

In disease, Dr Beaumont observed this surface to present a variety of essentially different appearances.

In febrile states arising from whatever cause, (such as obstructed perspiration, undue excitement by stimulating liquors, or overloading the stomach with food,) and in those states where the nervous system is said to be depressed or disturbed, (as under the influence of fear or anger,) the villous coat became sometimes red and dry, or at other times pale and moist, and lost its smooth and healthy appearance; the secretions became vitiated, sometimes mixed with bile, greatly diminished, or entirely suppressed; the mucous covering scarcely perceptible; the follicles flat and flaccid, with secretions insufficient to protect the vascular and nervous papillæ from irritation.

Under the circumstances in question, Dr Beaumont sometimes found eruptions, or deep-red pimples on the internal coat of the stomach; not numerous, but distributed here and there upon the villous membrane, and rising above the level of the mucous covering. The pimples were at first sharp-pointed and red; but frequently became filled with white purulent matter. At other times irregular, circumscribed, erythematous, red or purplish patches, varying in extent from half an inch to an inch and a-half in circumference, and occasionally exuding small drops of grumous blood, were seen on the internal coat. These appeared to Dr Beaumont to be the effect of congestion in the minute blood-vessels of the stomach. There were also seen at times, small red and tender aphthous crusts, in connection with the red patches. Abrasions of the lining membrane, like the rolling up of the mucous covering into small shreds or strings, leaving the papillæ bare, for an indefinite space, were not uncommon.

When these diseased appearances were considerable, and particularly when there were corresponding symptoms of disease, as drying of the throat, thirst, dry skin, accelerated pulse, &c., very little or no gastric juice was secreted, and none could be extracted from the stomach, not even on the application of food. In this condition of the stomach, drinks were immediately absorbed, none remaining two minutes after being swallowed; while food remained undigested for twenty-four or forty-eight hours or more, increasing the derangement of the whole alimentary canal, and aggravating the general symptoms of disease.

After excessive eating or drinking, Dr Beaumont observed, that chymification was retarded, the fluids became acrid, sharp, and purulent, so as to excoriate the edges of the aperture left open by the wound, and almost invariably to produce aphthous patches. Whenever this morbid condition of the stomach occurred, there was generally a corresponding appearance of the tongue, which became furred and dry, and covered with a whitish, yellowish, or yellowish-brown coat. At these times, the patient complained also of headach, vertigo, heaviness and pain in the eyes, dimness of sight, pain and distress about the *scrobiculus cordis*, lassitude, and loss of appetite. His countenance became sallow, and his bowels slow.

Dr Beaumont remarks, that the morbid changes of the mucous surface of the stomach were seldom indicated by any ordinary symptoms or particular sensations, unless when in considerable excess, or when there were corresponding symptoms of a general affection of the system. They could not, in fact, he says, in most instances, have been anticipated from any external symptoms; and their existence was ascertained only by ocular observation. " It is interesting," adds he, " to observe to what extent the most important organ of the animal system may become diseased, without manifesting any external symptoms of such disease, or any evident signs of functional aberration."* *A fortiori*, in those cases of ailment of the stomach, which are attended with severe and long continued pain, acidity, want of appetite, vomiting, &c., how much more serious must the organic changes be ! These changes, however, may not be evident to inspection after death; as they affect structures, which more than perhaps any other in the body, tend rapidly to alter their appearance as soon as life is extinct.

Catarrh, as well as dyspepsia, is an organic disease. After catarrh, the epithelium of the affected membrane is always produced afresh, and not unfrequently portions of the membrane tself have suffered so much as to require reproduction. Gerber states, that " should the mucous glands and the mucous follicles be altered in a less degree than the epithelium," then the discharge, besides the usual mucous-corpuscles and granules, contains a large addition of newly-formed small lenticular cells, instead of the usual older elements of the epithelium, who are large squamous granulated cells or cylinders. In these newly-formed small lenticular cells the nuclei are often recognised with difficulty, and this makes them look extremely like large exudation-corpuscles; from which, however, as they differ essentially, they are soon distinguished. Among these young epithelial cells we occasionally observe," says he, " true pus-corpuscles." †

That similar organic changes affect the other portions of the mucous system in their various diseases can admit of no doubt.

That many diseases, hitherto accounted functional, from no organic change of parts having been detected attending them, depend on abnormal states of the cells, which constitute so large a portion of our organs, and the contents of which are as various as the functions which the cells discharge, is extremely probable, The development, the multiplication, the transformation, and the degradation of cells, are all of them interfered with by the causes of disease. Cells, like the elements of the blood, are in a state of perpetual change, and are therefore much more likely to be the seat of disease than parts of a permanent character. The diseases of cells, though affecting parts extremely minute, and therefore requiring peculiar methods of investigation, evidently come under the head of organic affections. Nor must it be forgot that the formation of many pathological structures is but an imitation, or even a repetition, of the process, by which healthy tissues are formed by cells.

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* Experiments and Observations on the Gastric Juice, and the Physiology of Digestion, pp. 103, 107, 109, 138, 158, 172, 182, 238. 240. Plattsburgh, 1833.

† Elements of General Anatomy, translated by Gulliver, p. 102. London, 1842.

§ 6. *Dr Prout's division of Diseases.*

Dr Prout, in his work on the Nature and Treatment of Stomach and Urinary Diseases, tells us, that " Pathology, or the doctrine of diseases in general, is naturally comprised under three great heads or divisions, viz. *Functional diseases*, or those derangements arising from abnormal actions of one or more organs of which animal bodies consist: *Organic diseases*, or those diseases arising from actual lesions of one or more of the organs themselves: and *Mechanical diseases*, or those diseases arising from mechanical causes; such as from the imperviousness or destruction of organs by disease; or from the presence of foreign bodies, as for instance, of calculi, &c. in the kidney or bladder. As, however," he goes on to say, " we rarely find diseases exclusively belonging to either of these three great divisions; and as the two last divisions in particular are almost always associated in those diseases of assimilation and of secretion which form the chief objects of this volume, we shall consider the subject under two general heads only, viz.

" *Functional diseases*; or those diseases arising from the deranged operations and less obvious lesions of the assimilating and secreting organs; and

" *Mechanical diseases*; or those diseases arising from obvious lesions of organs; and from the presence of foreign bodies, as of calculi in the bladder, &c." *

The reflecting reader cannot help being staggered at the twofold and contradictory explanation of the word *functional* in these two classifications, exactly as " if a man should pretend to make use of a rule and bend it crooked,"† to answer his own purpose. In the first classification, the term *functional* is applied to " diseases arising from abnormal action of one or more organs;" in the second, its meaning is entirely changed, for it is applied not merely to " diseases arising from the deranged operations," but to those depending on " less obvious lesions of the assimilating and secreting organs."

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* Prout on the Nature and Treatment of Stomach and Urinary Diseases, p. 1. London, 1840.

† "Ὅμοιον γὰρ, κἂν εἴ τις, ᾧ μέλλει χρῆσθαι κανόνι, τοῦτον ποιήσειε στρεβλόν. Aristoteles de Rhetorica, Lib. li.

Here, I must observe, that it is a well known law in science, that magnitude forms no basis for classification. A lesion's being more or less obvious, affords no ground for the distinction of functional and mechanical diseases, adopted by Dr Prout. The being more or less obvious depends entirely on the greater or less degree of pains bestowed by the pathologist in his examination of diseased organs, and on the greater or less capability of the human senses, with their appliances, to detect morbid changes in minute organizations.

We are not satisfied with the mere naked eye in our attempts to discover diseased structure, but employ the microscope, which often displays changes in the form of minute parts, which the naked eye could never detect. But even when no morphological lesion is detected, we cannot conclude the structure to be free from organic disease. That there may be organic lesions of many parts of the body, which, from the minuteness both of the parts affected and of the alterations produced in disease, have hitherto eluded discovery, is generally admitted. Even Dr Prout speaks* of "obstinate functional affections, depending on lesions of the nervous system imperceptible by our senses,"—an expression tantamount to functional-organic disease.

§ 7. *Lobstein distinguishes diseases as dynamic and organic, attributing the former to injury of vital properties—Hartmann's remark on the term dynamic.*

Lobstein admits "two sorts of diseases; in the one, the vital properties only are injured; the others consist in a perceptible change in the structure of the organs." He calls the former *dynamic*, and the latter *organic.*†

At page 25, he speaks of the vital principle acting in diseases; exalting the properties of the different systems in fever, inflammations, and all acute affections; directing the morbid work, and leading on to crises.

The terms "vital principle," and "vital properties," to an injury of which principle or properties Lobstein refers functional or dynamic diseases, have been used to express the cause of all those actions in the living body which cannot be referred to any other general principle. Various phenomena, observed in the living body, which are referrible to the laws neither of mechanics nor of chemistry, are ascribed to the vital principle or vital properties. But these phrases have no meaning other than this, that the cause of the phenomena in question is neither mechanical nor chemical, but of an unknown nature. "These phenomena," remarks Dr

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* Prout on the Nature and Treatment of Urinary Diseases, p. 176. London, 1840.

† Traité d'Anatomie Pathologique, Tome i. p. 35. Paris, 1829.

Bostock, "differ essentially among themselves, so that if we make this want of resemblance the bond of union, we proceed upon the fundamentally erroneous plan of generalizing specific differences, or of associating phenomena, not because they resemble each other, but because they cannot be reduced under any other class."*

No distinct account is given of the nature of the vital principle, nor can be, seeing it must vary greatly in different organs of the body. For instance, digestion, not being explicable upon mechanical or chemical principles, is attributed to the agency of the vital principle; it is said to be the vital principle which enables the blood, while circulating through the body, to resist decomposition; neither fermentation, nor filtration, nor any other mechanical or chemical hypothesis throwing any light upon secretion, it is referred to the vital principle—an entity of whose existence we have no independent evidence, no conception of its mode of operation, no knowledge of any general laws by which it is directed. How, then, can we pretend to refer the cause of disease to a lesion of the vital principle?

Lobstein goes on to say (p. 35) that in dynamic diseases, as he styles them, "the physiological properties (irritability, sensibility, contractility, &c.) are either exalted, or weakened, or deranged, without our being able to perceive in any organ the smallest alteration of form, aspect, structure, &c." Now, as I have already remarked, our being or not being able to distinguish organic changes, may depend on the state of our organs of observation, and the degree of pains we take in applying them. But that irritability, sensibility, or contractility can be exalted, or enfeebled, or deranged, independently of changes in the organs possessing these properties, is a proposition contrary to reason.

In the next page, he asserts, that "the primitive affection of the vital properties constantly precedes the change of structure, however slight it may be, and that every disease is essentially dynamic before becoming organic." I have already explained that I hold the reverse of this to be true. Every morbific cause must operate on organs, not on functions—on the living structures, not on the powers which these structures possess, nor on the actions which they perform. At the same time, it is proper to observe, that organic changes may be either primary or secondary. The primary changes are those which immediately ensue on the application of any morbific cause, and which give rise to the first functional derangements observable in any disease; the secondary are those which ensue from continued disease, ending in many instances in complete disorganization of the structures affected, and of course interrupting more and more their functions. For example, the external causes which excite inflammation, (such as inflammation of the conjunctiva), have been supposed to act, in the first instance, on the nervous system, so as to suspend the supply of nervous influence to the small vessels, and to lead to the dilatation of these vessels, to a retardation in the flow of blood through them, and to its stagnation. These primary organic changes in the sanguiferous system, (whether arising from a previous organic change in the nervous system of the part or not, we shall not now stop to inquire), are speedily attended by redness and swelling, followed by the functional derangements of heat and pain. After a time, secondary organic changes not unfrequently ensue, such as secretion of pus, ulceration, &c., which are attended in their turn by another train of functional phenomena. Lobstein would attribute the first step in inflammation to an injury of the vital properties of the part affected. It seems a more correct and satisfactory view of the matter, that the dilated state of the small vessels, and the retardation and stagnation of the blood, which are the earliest organic changes discoverable by the microscope in a part artificially excited to inflammation, are owing to a diminution of nervous influence, and this to an organic change in the nerves which supply the vessels, produced by the exciting cause of the disease.

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* Elementary System of Physiology, vol. ii., p. 191. London, 1828.

To attribute any disease to an injury of the vital principle is a mere waste of words, without any meaning whatever. Life, the vital principle, or the vital properties, are always associated with, and dependent on organization; and it is this which suffers primarily in every disease. True it is, that in the ovum, life precedes the development of most, nay, of all the organs of the body as they exist in the foetus at birth; but still life is from the first moment of conception associated with structure, and dependent on the organization of the germinal vesicle and germinal spot; and it is a degeneration of these or of some of the other structures of the ovum, not any lesion of the living principle, which gives rise to the abnormal conditions so frequently met with in the foetus, when it is expelled, and especially when it is expelled prematurely, from the uterus.

With respect to the term *dynamic* as applied to diseases, Hartmann makes the following judicious remark:—" Ut omnis evitetur confusio, monendum hic erit, non strictissimam hic esse vocabuli *dynamici*—significationem; neque sub morbis dynamicis meram solius efficientiae vitalis adfectionem, ab omni mutatione materiali liberam, intelligi; inter vires enim et materies corporis vivi arctissimus intercedit et necessarius nexus, ita quidam ut singulas seorsim mutari penitus repugnat."* How much better to dismiss such terms as *functional* and *dynamic* altogether from medical language, than retaining them, to be obliged to qualify so much their signification.

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* Theoria Morbi, p. 63. Vindobonæ, 1828.

§ 8. *Dr Billing, a functionalist—his extraordinary views of disease—Opposite and correct views of Andral.*

Dr Billing's First Principles of Medicine is a work replete with valuable and pithy practical remarks, but is not free from objections on the score of functionalism.

For instance, in the first page of his work, Dr Billing, after stating that "the very first step towards treating disease successfully is to ascertain, as far as possible, the nature of the *alteration* which has taken place in the *seat* of the *disease*, or what has been called, technically, the *proximate cause*;" and that "in default of this knowledge, which is sometimes unattainable, we can only depend upon analogies drawn from what we know to be the fact in other cases, and from *physiology*, which is a careful *observation* of the *phenomena* resulting from the *functions* of the different *parts in health*;" goes on to say, that "an accurate knowledge of the *functions* in their healthy state is the more necessary, because considerable deviations from the ordinary routine occur without disease; and as they are frequently much disturbed without any discoverable alteration in the structure of the organs having taken place, morbid anatomy alone will not be sufficient to elucidate all causes of disease; whilst, on the other hand, it is necessary to be aware that a considerably diseased change of structure may exist with little or no interruption of function."

Here we have three separate propositions.

To the third, namely, that "a considerably diseased change of structure may exist with little or no interruption of function," we cannot assent. It is true, some organs will bear, with apparent impunity, very great organic changes—even the brain sometimes seems to do so, but that interruption of function must follow change of structure is a self-evident proposition. The interruption of function may, indeed, not be indicated by any very evident symptoms, but still it must exist. No part of the frame is made without its use. No organ can be altered in its structure by disease, and retain its function in all its integrity.

The second proposition, that the functions are "frequently much disturbed without any discoverable alteration in the structure of the organs," may be admitted to be true, with this qualification, that the alteration not being discovered is no absolute proof that it does not exist, but only, that the method or the means used in the investigation have not been sufficient to detect it.

The first proposition, that "considerable deviations from the ordinary routine [of the functions] occur without disease," is just as much as if we were to say, that considerable disease occurs without disease; for the very definition of disease is, that it is deviation from the ordinary routine of the functions. No one but a functionalist could admit so extravagant a proposition as this.

In place of the paragraphs quoted above from Dr Billing, let me substitute the following propositions;—

1. The alteration which takes place in the seat of any disease is its proximate cause.

2. To ascertain this alteration is not in all cases attainable by our present methods, and with our present means, of investigation.

3. To call a disease *functional* or *dynamic*, because the nature and seat of the alteration upon which it must depend, is unknown, would be equivalent to saying that it had no proximate cause.

4. When the alteration is not detected, we may sometimes venture to conclude from analogy, what is likely to be the proximate cause.

5. We may draw conclusions also from the deranged state of the functions, as to the organ affected, and the probable nature of the alteration, or proximate cause.

6. No derangement of function can happen, without an alteration, transient or permanent, in the organ which performs the function. But the alteration may not be discoverable during life, nor after death.

7. No diseased change of structure can exist without a corresponding interruption of function. But the interruption may be observed, neither by the patient nor by the practitioner. It may produce no pain nor lameness, but it must more or less impede the function which the affected organ is destined to perform.

These views, which I would substitute for the strange and extravagant assertions of Dr Billing, are identical with those of Andral, who, speaking of nervous asthma, remarks that "science possesses a considerable number of observations which prove that an alteration of the nervous system of the respiratory apparatus produces the functional disorders which characterize nervous asthma. But," asks he, "can these functional disorders exist independently of all alteration?" To this he replies, "To my mind it is clear that every disorder of a function must have for cause an alteration in the organ; but we think also, that these organic alterations are not always appreciable." *

The same author remarks, that when "anatomical disorders are not perceptible, we must not hasten to the conclusion that they do not exist, for upon this subject, science must be regarded as only provisional. "What do we know, in fact," he asks, "in pathological anatomy? Lesions of texture, of form, of colour, but nothing farther. And regarding the alterations of the fluids, what do we know? Some states which are not normal, that is all." *

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* Cours de Pathologie Interne, Tome i, p. 53. Paris, 1836.

To return to Dr Billing, at page 148, we find him opposing "functional debility" to "real debility of the frame." Yet, wherein lies the difference? In the weakness of fever, is it not the frame which is debilitated, just as much as in weakness brought on by starvation, or by haemorrhage?

At page 182, he speaks of nervous diseases, such as morbid sensibility, or what others term irritation, depending "upon an alteration of the dynamic state of the nervous tissue." We can conceive the state of the nervous tissue to be altered, and consequently its power to be affected; but a change in the power without a physical alteration of the tissue, though quite conformable to the views of the functionalists, is impossible.

§ 9. *Abernethy distinguishes disorder from disease—Dr Venables' views of organic disease.*

Mr Abernethy has made some remarks on the meaning of the words disorder and disease.

"Disorder," says he, "I shall define to be an unhealthy state of the feelings or functions of parts, without any apparent alteration of structure; and disease, a visible alteration in the appearance or structure of the affected part: disorder is nervous; disease is the effect of vascular actions, excited by nervous disorder; an organ may become diseased to a certain degree, and yet disorder ceasing, its feelings and functions may be natural and healthy, yet disease may have a tendency to establish disorder.†

Disorder, in Mr Abernethy's language, is synonymous with functional disease of some other authors. His statement is, that disorder is attended with "no apparent alteration of structure," while in disease, there is "a visible alteration in the appearance or structure of the affected part." The circumstance of the alteration being apparent or not, is quite an insufficient basis for the distinction he attempts to draw between disorder and disease. In fact, his introduction of the word "apparent" into his definition, would lead us to suspect that he acknowledged an imperceptible organic change as a necessary antecedent to what he calls disorder, and what others would term functional disease.

The assertion, that "an organ may become diseased to a certain degree, and yet disorder ceasing, its feelings and functions may be natural and healthy," is a contradiction in terms; it amounts to an admission that a part may be both diseased and healthy at the same time. If a part be diseased, its functions must suffer, perceptibly or imperceptibly.

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* Cours de Pathologie Interne, Tome i., p. 13. Paris, 1836.

† On the Constitutional Origin and Treatment of Local Diseases, p. 247. London, 1829.

Such are the strange notions to which functionalism sometimes conducts its followers!

What Mr Abernethy calls disorder is the same state, I presume with that which Sir Astley Cooper styles "irritation"—the *first* degree of disease, but still the result unquestionably of organic change. The *second* degree is inflammation and its sequelæ. The *third* degree includes permanent alterations of structure—"those alterations," to use the words of Dr Venables, "which render the structure more than useless, for it becomes a perpetual source of irritation, and generally speaking ultimately proves fatal."

The author last mentioned has subjoined to his Clinical Report on Dropsies, an appendix, On the Theory and Treatment of Organic Disease in General, containing many judicious remarks,

Setting out with the principle that "to suppose that an organ can be functionally deranged without a corresponding change in its structure, would be to imagine an effect without a cause," (p. 143.), he admits the three degrees of change to which I have just alluded.

The *first* change, which is usually considered nervous, he thinks may in some cases be referred to minute alterations in the blood. The *second*, or inflammatory, he traces in many instances to errors in digestion, following on this point the views of Dr Philip. The *third* degree embraces those incurable alterations of structure, which arise from the former degrees, and wholly unfit the organs affected from fulfilling their functions.

§ 10. *Confused classification of eye-diseases by Chelius.*

As a specimen of the confusion, to which the adoption of the division of diseases into functional and organic, must necessarily lead, I may refer to Chelius' classification of eye diseases.

In his "Handbuch der Augenheilkunde," he divides the diseases of the eye into two classes, viz. dynamic and organic.

Under the former, he includes inflammations and nervous diseases; under the latter, all those diseases which consist in a change of the normal form, position, composition, and structure of the parts belonging to the eye, or in the presence of foreign bodies.

The ophthalmiæ, then, in which take place such evident changes of structure, are classed among the dynamic diseases. Even collections of pus in the eye are brought under this head; while other sequelæ of the ophthalmiæ, such as synechia, prolapsus of the iris, opacities of the cornea, &c., are separated altogether from the diseases in which they originate, and are classed as organic affections.

Between the ophthalmiæ and the organic diseases of the eye, we have the neuroses, which comprehend, among other disorders, myopia, presbyopia, myodesopia, and amaurosis, all of which are dependent on organic affections.

Such is a specimen of the confusion, to which the adoption of a system not founded on true first principles, must infallibly lead.

§ 11. *Mr Travers' definition of Amaurosis—his classification of the Amauroses—his enumeration of the causes and symptoms of Organic and Functional Amaurosis.*

As one of the earliest as well as one of the most elaborate expositors of that view of amaurosis, which regards it as in some cases functional, in others organic, Mr Travers claims a more than ordinary attention.

"The term amaurosis," says he, "comprehends all those imperfections of vision which depend upon a morbid condition, whether affecting structure or function, of the sentient apparatus proper to this organ."*

Had I not already commented upon similar statements, I should be disposed to say, that the enigma of the sphinx was nothing, compared to this definition; for although the one set of imperfections of vision, namely, those depending upon a morbid condition of the *structure* of the sentient apparatus of the eye are readily comprehended, the other set, which are said to depend upon a morbid condition of the *function* of the same apparatus, are, without some explanation, and some modification of the terms here used, altogether beyond my conception.

Mr Travers tells us, that amaurotic affections differ in kind, and that this affords a scientific basis of classification. He divides them into two classes, the organic and the functional. "The first comprehends," he says, "alterations, however induced, in the texture or position of the retina, optic nerve, or thalamus. The second includes suspension or loss of function of the retina and optic organ, depending upon a change either in the action of the vessels, or in the tone of the sentient apparatus."†

To vindicate such appellations as *organic* and *functional*, the former class should comprehend amauroses depending on changes of texture, and the latter amauroses independent of such changes. Mr Travers' second class depend on a change in the action of the vessels, which nourish the nervous optic apparatus, or a change in the tone of the nerves. We may admit congestion and inflammation as results of changes in the vessels, although not in their action alone; but the tone of a nerve is rather mysterious, nerves being parts whose functions appear in no degree dependent on elasticity, or any power of contraction or extension. By the tone of a nerve is meant, in fact, its health. When it is said that the tone of a nerve is changed, it is meant that it is in a state of disease, which is equivalent to saying that its action, composition, and structure are changed.

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* Synopsis of the Diseases of the Eye, p. 293. London, 1820.

† Ib. p. 139.

As causes of organic amaurosis, Mr Travers enumerates—

1. Lesion, by which he means wounds, extravasation of blood, inflammatory deposition upon either of the surfaces of the retina, (he might have added "or into the substance" of that membrane), and loss of transparency of the retina. Loss of transparency must here be taken as a sign of some other organic change, probably the result of inflammation, for mere loss of transparency can scarcely be deemed in itself a sufficient organic cause of amaurosis.

2. Morbid growths within the eyeball, dropsy, atrophy, and all such disorganizations as directly oppress or derange the texture of the retina. I cannot say, that Mr Travers shows much address, in thus enumerating as a particular cause, a whole host of organic causes of amaurosis; for how many of them fall under the head of disorganizations oppressing or deranging the texture of the retina! Neither can it be admitted, that dropsy of the eye, or morbid growths within the eyeball, come legitimately among the causes of amaurosis; for on such diseases presenting themselves to our observation, although we found vision impaired or destroyed, we should never call them cases of amaurosis, but say this is a growth within the eye, this is a dropsy of the eye. It would clear the subject, then, to dismiss this second division of the causes of organic amaurosis, so far as it comprehends diseases of other textures than the retina. Atrophy of the retina, and neuromata and other depositions in that membrane, constitute, of course, an important division of the organic causes of amaurosis.

3. The state of apoplexy, hydrocephalus, tumours or abscesses in the brain, in or upon the optic nerve, or its sheath, and thickening, extenuation (by which is meant, I presume, attenuation), absorption, or ossification of the latter, *i. e.*, of the optic nerve or its sheath.

Such are the causes of organic amaurosis, as classified by Mr Travers.

The causes of functional amaurosis he enumerates in two divisions. His *first* division comprehends—

"Temporary determination; vascular congestion or vacuity, as from visceral and cerebral irritation; suppressed, or deranged, or excessive secretions, as of the liver, kidneys, uterus, mammæ, and testes; various forms of injury and disease; and sudden translations of remote morbid actions."

This first division of the causes of functional amaurosis includes fulness of vessels and emptiness of vessels,—hyperæmia and anæmia of the optic nervous apparatus. It includes these affections, whether they be idiopathic, sympathetic, or symptomatic; that is to say, whether they depend directly on the state of the optic nervous apparatus, or arise indirectly from disorder in some remote organ; and whether they constitute an original and independent disease, or are merely a part or consequence of a similar disorder of the brain. A local excess of blood, or hyperæmia, and a local want of blood, or anæmia, are generally admitted by pathologists as causes of disease. It appears certain, that suppressed vascular or secretory action, in any one organ, is apt to be followed by determination to other organs, and especially to the brain. May it not often be the case, however, that the determination of blood to the brain is the precursor, and the remote cause, of the suppressed secretion or circulation in other organs?

Admitting the reality of cases of amaurosis arising from the causes here indicated by Mr Travers, how much more simple and true would it be to call the disease *vascular amaurosis* than *functional*—the one variety being hyperæmic and the other anæmic!

The question remains, how far such varieties of amaurosis are to be regarded as organic diseases. I do not know, that dissection or microscopical examination has thrown any particular light on the state of the capillaries in hyperæmia or anæmia. It appears to be the common opinion, that the state of the vessels in congestion and determination of blood is essentially the same (only different in degree) as that in inflammation. An "enlargement through growth," which Mr Mayo considers* likely to be an effect of continued local determination, or even a "relaxation of the coats" of the vessels, which he regards as the primary cause of such an affection, would come properly under the head of organic changes. But independently altogether of the state of the vessels, the blood itself is an organ, and its plenitude or scantiness an organic disease of the very highest importance.

Upon this subject, the following remarks of Mr Lawrence are worthy of attention. Speaking of the division of amaurosis into organic and functional, he says, "If we could see the parts, it might not be so easy as the familiar employment of these terms implies, to establish the distinction in question; for medical inquirers have not yet determined the exact limits of the change which they call organic. We apply the epithet functional to those diseases which produce no changes in a part recognizable after death. But we cannot infer in these cases that no alteration had existed during life. The state of an organ necessary to the correct execution of its function is a living not a dead condition; it requires not merely a certain organization as we find it after death, but a supply of healthy blood in a certain quantity, a natural state of nervous influence and sympathy, and perhaps other circumstances not clearly understood. If all these conditions are combined, can we consider it possible that the function should be disordered or interrupted? If one or more should be altered or wanting, can the disease be properly regarded as simply functional? Vascular congestion is an obvious deviation from the normal state of a part. If the retina, or any other organ, be said to be functionally disordered, when its vessels appear twice as numerous and large as in the normal condition, the expression must be employed too loosely to convey any clear information. Some restrict the term organic to alterations in the essential structure of an organ, thus excluding changes in the state of circulation, even although they should be visible after death. Since, then, the epithets organic and functional are indefinite, being employed in different senses by different persons, since they do not denote, generally, well ascertained and clearly understood conditions of parts; and since the situation of the nervous apparatus of sight renders it impossible for us to know its exact state in most instances, I consider this distinction of amaurosis to be of little practical utility, but from its vagueness rather calculated to mislead."*

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* Outlines of Human Physiology, p 53. London, 1837.

Mr Travers' *second* division of functional amauroses comprehends—

"Paralysis idiopathica, suspension or exhaustion of sensorial power from various constitutional and local causes; from undue excitement or exertion of the visual faculty; and from the deleterious actions of poisons on the nervous system, as lead, mercury, &c."

The ancients applied the term *paralysis* to a loss of motion, of sensation, or of both. There is no inconsistency, therefore, in using it to signify a diminution or destruction of sensorial power. By the epithet *idiopathic* is probably meant independent of pressure on the optic nerve. Mr Travers, in fact, goes on to show that this is his meaning, for he uses the name *idiopathic paralysis* as synonymous with suspension or exhaustion of sensorial power, and attributes this suspension to two causes, in particular; viz., undue excitement or exertion of the optic nerve, and the action of poisons, both of which are generally admitted as causes capable of producing amaurosis. How these two causes act, and whether they produce amaurosis in one and the same way, are important questions. Such expressions as suspension of sensorial power, exhaustion, and fading, throw no light on the subject.

Excitement or over-exertion of the retina is likely to produce determination of blood to that membrane, congestion, inflammation, and ultimate atrophy, all of which I consider as organic affections.

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* Treatise on the Diseases of the Eye, p. 508. London, 1841.

Lead and mercury do not probably act in one and the same way, in producing amaurosis. Amaurosis from lead is attended by colic, vertigo, headach, epilepsy, deafness, and various other symptoms, few or none of which attend amaurosis from mercury. The organic changes, therefore, produced by these two poisons are likely to be different. Other poisons, and especially narcotic vegetable ones, such as opium and belladonna, undoubtedly act partly by producing congestion; but besides this, each of them has its own specific effects on the optic nervous apparatus,—effects not less certainly organic, that in general they are but of temporary duration.

Before proceeding to enumerate the symptoms by which organic and functional amauroses are to be discriminated, Mr Travers makes an incidental remark or two, which deserve notice. He states:—

1. That organic amaurosis is incurable.
2. That many forms of functional amaurosis are incurable.
3. That functional, by continuance, lapses into organic amaurosis.*

Now, amongst the causes of organic amaurosis, Mr Travers enumerates extravasation of blood upon the retina, and apoplexy, neither of which conditions are absolutely incurable. The incurability of any of the amauroses enumerated as functional by Mr Travers, must be owing entirely to the cause being truly organic. The admission, that functional lapses into organic amaurosis, taken in connection with what he afterwards states, namely, that a great source of difficulty "is the circumstance of many symptoms being common to both classes," is a partial acknowledgement of the defective grounds of his classification.

Mr Travers also enumerates the following as certain sources of irritation which he has known to produce functional amaurosis—that is, loss of vision, although the eye is "sound, and the orbit untouched;" viz.

1. Wound of the scalp, involving branches of the fifth nerve. 2. Caries of the skull. 3. Abscess and caries of the *antrum maxillare*, with excessive œdema of the integuments of the lids and cheek. 4. A large abscess under the masseter and muscles of the cheek. 5. An abscess at the extremity of a molar tooth, while the crown of the tooth was sound.

To these he adds the following seven other causes of functional amaurosis, which he says "are sufficiently obvious.

6. Excessive use or abuse of the visual faculty. 7. Disordered stomach, liver, uterus, &c. 8. Sudden and alarming depletion.

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* Op. cit., p. 508. London, 1841.

9. Excessive or obstinately suppressed secretions. 10. Difficult dentition. 11. Worms in the intestines. 12 Deleterious effects of noxious agents on the eye or the system.

From the indefiniteness with which it is expressed, it is not easy to judge of the twelfth of these causes. The sixth acts directly on the optic nervous apparatus. So also may the eighth. The remaining nine must act sympathetically, or by a reflex operation, on the organ of vision. In investigating cases of amaurosis arising, or supposed to arise, from such causes as an abscess connected with the fang of a tooth, care must be taken to ascertain whether the reflex affection is not one rather of inability to use the eye; from a morbidly exalted degree of common sensibility, or an impeded mobility, than one of diminished power of vision; a reflex disease, in fact, of the ophthalmic division of the fifth nerve, or of the third, rather than one of the second.

Just as positively as Mr Travers believes, that the twelve causes above enumerated are capable of extinguishing vision, while the eye and optic nerve remain sound, I believe this to be impossible; but that in every one of the instances mentioned, there must be some change in the condition of the optic nervous apparatus, sufficient to produce at least temporary blindness. It is inconceivable that such a cause as an abscess at the fang of a tooth could produce blindness, while the optic nerve remained sound; but it is not difficult to comprehend that the painful affection of the branch of the fifth nerve, connected with the tooth, might by a reflex action, so exalt the sensibility of the ophthalmic branches of the same nerve, that any attempt to use the eye was attended with excruciating pain, or so affect the branches of the third or sixth nerve, that they were rendered unable to communicate the necessary stimulus for moving the muscular parts, either external to the eyeball, or placed within it, and which are essential to a due performance of its office. We can even suppose a reflex effect propagated from the affected nerve to the optic nerve, or to its vessels, sufficient to render the eye inadequate for the function of vision. According to this supposition, an actual organic amaurosis would be produced sympathetically. According to the two former suppositions, a disease might be sympathetically produced, either in a sensitive or in a motive nerve, which might simulate amaurosis—an event by no means unfrequent in its occurrence.*

The symptoms of organic amaurosis described by Mr Travers, he brings under five heads, embracing the state of the pupil, that of the superficial vessels of the eyeball, the colour and form of the sclerotic, the appearance of the vitreous humour, and that of the *fundus oculi.*

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* Morbi dentium in morbos oculorum mutantur, et contra.—Baglivi.

1. The pupil is stated to be either fully dilated and contracting feebly on the sudden admission of light, or preternaturally dilated and absolutely motionless. It is added, that dilated pupil, though not invarable in either, is common both to organic and to functional amaurosis. If so, it ought not to have been placed here at all, but under the head of symptoms common to both. This admission shows still further, the imperfect foundation upon which stands the distinction of organic and functional amaurosis.

2. Mr Travers next mentions "congestion of the superficial vessels, especially of the long fasciculi of conjunctival veins." Congestion of the conjunctival vessels is as likely to be a symptom of amaurosis from determination of blood, which Mr Travers reckons as one of the functional varieties of the disease, as of any of those which he regards as organic. Not the smallest confidence, in fact, can be placed in this symptom, as indicative of organic amaurosis, in Mr Travers' sense of the term. The enlargement of the rectal arteries and veins, which vessels I presume are what Mr Travers means by "long fasciculi of conjunctival veins," is more significant than any mere congestion of the superficial vessels of the conjunctiva. A varicose state of the rectal vessels, as is generally to be observed in advanced cases of glaucoma, at once leads to the suspicion of serious organic changes having already occurred in the retina and optic nerve.

3. As a third sign of organic amaurosis, Mr Travers notices "a peculiar bluish grey tint of the sclerotic coat; sometimes a degree of bulging or protrusion on one or both sides of the globe; or simply a loss of sphericity, its sides appearing flattened." The bluish grey tint, and the bulging or protrusion here mentioned, are generally the effect of inflammation and thinning of the sclerotica, with preternatural adhesion between the sclerotica and choroid. The deterioration of vision which attends this state does not come, therefore, so much under the head of amaurosis, as of sclerotico-choroiditis. Loss of sphericity, and flattening of the sides of the eyeball by the action of the recti, is generally attended by softening of the eyeball, from a defective secretion of the vitreous humour, and is a common sequela of retinitis. A squarish form of the eyeball is not always a sign of disease, for eyes are often somewhat flattened under the tendons of the recti, which are normally firm and perfectly sound.

4. Mr Travers next describes glaucoma, in its first and second stages, as one of the signs of organic amaurosis. In these two stages, glaucoma is characterized chiefly by a greenish reflection from the crystalline, and is in general an affection of the crystalline only. In its more advanced stages, glaucoma involves a morbid condition of the vitreous humour, the retina, the choroid, the iris, and indeed of all the tissues of the eyeball, and is accompanied by absorption of the medullary substance of the optic

nerve. Glaucoma, in its early stages, is often unattended by any amaurotic affection; in its later stages, it destroys vision and disorganizes the eye by a process *sui generis.* That it is often coincident with amaurosis cannot be denied, but, on the other hand, it is as frequently an altogether independent affection.

5. Under the fifth sign of organic amaurosis, Mr Travers appears to describe glaucoma a second time, and along with it one of the varieties of what is styled cat's eye. The appearance which he describes "of a white or greenish-yellow spot, apparently in the fundus of the eye, a little to one side of the visual axis," and which "is seen only in a strong light, and in particular directions of it," is merely the first stage of glaucoma. That this cannot be considered as a sign of amaurosis follows from the admission, that it is occasionally seen in persons who make "little, if any complaint of their sight."

Mr Travers mixes up with this description of glaucoma, that of senile cat's eye, in which there is a silvery or resplendent reflection from the bottom of the eye,—an appearance very different from that of glaucoma. The cause of the appearance in senile cat's eye is unknown.* It is met with both in amaurotic eyes and in eyes which retain vision, as Mr Travers states. It cannot, therefore, be regarded as pathognomonic of amaurosis.

Mr Travers goes on to enumerate the changes which the eye presents when it is disorganized by deep-seated inflammation; and after this, the appearances, which are observed in those cases where the retina becomes collapsed or coarcted, from absorption of the vitreous humour, and an effusion beneath the choroid. Such conditions of the eye are highly important to be known, but do not belong to the category of amaurosis.

Mr Travers here narrates the case of a young man, amaurotic of an eye from a tumour pressing on the thalamus and optic nerve of the same side. The eye had no unhealthy appearance; the pupil was regular and pretty active. The symptoms, in addition to the loss of sight, were those of disease in the brain, deep-seated pain in the fore part of the head, on the same side as the amaurosis, disposition to sleep, inability to employ the mind, disordered digestion, ptosis, slight strabismus, with occasional double vision, followed by emaciation, debility, and death. This case is highly interesting, as affording an illustration of some of the most remarkable symptoms of cerebral amaurosis.

Mr Travers next refers to various cases of amaurosis from injury, such as a blow on the temple, or the eye. "Of these," he says, "some were attended with signs of disorganization, some were superficially inflamed, and others presented no external appearance of injury."

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* The appearance of senile cat's eye is well represented by Ammon, Klinische Darstellungen der Krankheiten des Menschlichen Auges, tab. xv. fig. 10, 11. Berlin, 1838.

Lastly, under this head, Mr Travers directs attention to congenital organic amaurosis, of which he distinguishes four forms. In the *first*, the eye is small and soft, the iris tremulous, and the globe affected with perpetual oscillation. The *second* is albinism, which ought not to be classed among the forms of amaurosis, as vision is only dazzled and confused in that state, from the absence of the choroid pigment. The *third* is microphthalmos, characterized chiefly by extreme smallness of the cornea. In the *fourth*, there is no appearance of organic derangement, the defect being probably in the brain.

Mr Travers distinguishes three varieties of functional amaurosis, viz.

1. The *symptomatic*, the disease being a symptom merely of some general disorder of the system; as, general plethora, general debility, &c.

2. The *metastatic*, produced by the sudden transference of morbid action from another organ; as, the skin, testicle, &c.

3. The *proper*, depending immediately on a peculiar condition of the retina. As examples of such conditions he gives *visus nebulosus* and *muscæ volitantes*, both of which are names of symptoms, not conditions of the retina.

He then proceeds to treat of these three kinds of functional amaurosis each in its order.

1. As causes of *symptomatic functional amaurosis*, falling under the general heads of constitutional disease and general debility, Mr Travers enumerates, 1. Typhus. 2. Scarlet fever. 3. Various forms of acute constitutional disease. 4. Infantile fevers. 5. Chronic wasting diseases, in which organic changes interrupt the nutrition of the system. 6. A rapid and severe salivation. 7. Mental emotions, and especially grief and anger. 8. Prolonged suckling. 9. Impaired energy of the whole nervous system, occasioned by various states of physical disorder.

Some of these causes are so vaguely expressed that it is impossible to determine what is meant. What can we make, for instance, of "various forms of acute constitutional disease," and "various states of physical disorder?" It is not to be doubted, I believe, that typhus fever, scarlet fever, relapsing, and infantile remittent fever produce amaurosis, sometimes directly, by congestion in the brain, inflammation of the arachnoid, and effusion; at other times, by giving rise to secondary retinitis. The amaurosis which sometimes attends a burst of anger appears to be apopletic. When grief produces amaurosis, there are evident signs of congestion or inflammation within the head; and the same thing may be observed, when prolonged suckling, and certain chronic wasting diseases, such as scorbutus and albuminuria, affect the sight. The occasional co-existence of general debility, with local determinations of blood, and other organic derangements, is a fact universally admitted; and, in such cases, the optic nervous apparatus is often affected.

Mr Travers mentions the following as symptoms of amaurosis depending on vascular congestion:—1. Dilated and sluggish or immovable pupil. 2. Ptosis or strabismus. 3. Oblique or double vision. 4. Preternatural action of the carotids and flushed face. 5. Sense of weight, pain, or stricture of the scalp. 6. Lethargy. 7. *Tinnitus aurium.* 8. Greatly disordered and irritable stomach. 9. On straining, stooping, and on first lying down, the seeing of luminous sparks or flashes. 10. A reflection of one or more of the choroidal vessels, the visible pulsation of which is a cause of distress to the patient.

With respect to these symptoms of amaurosis from plethoric congestion, (which is plainly an organic affection), it must, on the whole, be admitted that there is very little diagnostic in them. Dilated and sluggish or immovable pupil is a symptom of amaurosis depending on pressure on the brain by tumours or by water, as well as by congested vessels; and the same holds true respecting ptosis, strabismus, and oblique or double vision. Mr Travers says, " double vision of the affected eye," but, although one eye may in some cases see two or more images of an object, as when a myopic eye views a candle beyond its point of distinct vision, the diplopia which attends amaurosis generally occurs when both eyes are open, and is owing to a slight inequality in the action of the muscles of the two eyes, so that their axes no longer maintain their proper relations to each other. Even throbbing of the carotids, flushed face, sense of weight, pain, or tightness in the scalp, and *Tinnitus aurium*, are attendant on what Mr Travers would admit to be organic affections of the head. As for lethargy and irritable stomach, tumours in the brain are well known to produce these symptoms. Whether the pulsation, which patients labouring under congestive amaurosis sometimes experience, depends on the choroidal or on the retinal vessels, is a point scarce worth discussing; but surely Mr Travers draws too much on our credulity, when he wishes us to believe, that one of his patients saw accurately the *zona minor iridis!* Neither does the epithet "visible," applied to such pulsations by Mr Travers, appear to be correct; for they are felt, rather than seen, by the patient.

Mr Travers states, that a loss of balance in the sanguiferous system, occasioning an undue determination of blood to the head, often exists, distinct from general plethora. He says it is aggravated by loss of blood.

He next turns to amaurosis from inanition, and mentions that owing to the coincidence of a dilated and immovable pupil, muscae, and a deep-seated pain in the head, with occasional vertigo, and its occurrence often in a corpulent habit, it is sometimes mistaken for its opposite, namely, that from plethoric congestion. It follows uterine haemorrhage, and large and sudden depletion for acute diseases. The pain, Mr Travers states, is not confined to the region of the orbit, although it affects chiefly the same side of the head. It is perhaps connected with an imperfect injection of the medullary substance. It is relieved by a cautious use of tonics, but aggravated by whatever diet or medicine lowers or stimulates.

That the effects of inanition are in many instances similar to those of plethora is a very old observation. "Convulsions," says Hippocrates, "arise either from repletion or from inanition."* A certain amount of vascular pressure on the brain is necessary for carrying on the functions of that organ—greater or less than this amount disturbs these functions; and the same thing holds with regard to the organs of sense. "Pressure of blood," says Müller, speaking of the brain, "still within its vessels, also produces insensibility. And the effects of inanition are, in this respect, exactly the same as those of pressure."† Hyperæmia and anæmia have effects on the nervous system exactly similar to those produced by changes universally acknowledged to be organic, such as tubercles, pus, extravasated blood and water. In hyperæmia and anæmia, the blood and the vessels are the organs affected. These diseases may be transient, or they may persist, and lead to hypertrophy or to atrophy; but, whether transient or persistent, it would be a false view to regard them otherwise than as organic affections.

2. As examples of disease productive of *amaurosis by metastasis*, Mr Travers mentions; 1. Pulmonary congestion threatening effusion into the chest. 2. Gout in the foot and in the stomach. 3. Swelled testicles suddenly reduced by leeches and cold applications. 4. Sudden suspension of the catamenia. 5. Suppressed bleeding from piles. 6. Rapid healing of large ulcers of long standing. 7. Sudden retrocession of cutaneous eruptions.

The symptoms of metastatic amaurosis noticed by Mr Travers are. 1. Palsy of the upper eyelid. 2. Loss of sight. 3. Pupil dilated and motionless. 4. Pain in the head. 5. A feeling in the head, compared by the patient to that of opening and shutting. 6. The sensation of a dark screen rising gradually from below upward. 7. In gouty cases, vomiting, and pain in the stomach. 8. The sudden cessation of disease in the organ first affected.

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* Aphor. Sect vi. § 39.

† Elements of Physiology. Translated by Baly, vol. ii. p. 1391. London, 1842.

That amaurosis occurs as a disease of conversion does not admit of doubt; and it seems equally clear that the affection of vision in such cases is generally produced by congestion, inflammation, or effusion within the head. It may be doubted, however, whether the conclusion is valid, that the affection of sight is always an effect of the sudden cessation of the disease previously existing in some remote organ. It seems fully as probable that, in some cases at least, the supervention of the new disease precedes the retrocession of the old, and may even be a cause of the yielding of the latter, the one disease relieving, or proving curative of, the other. It seems a much more likely supposition, when a severe disease exists in one part of the economy, such as some of those enumerated by Mr Travers, that, through the participation of the constitution in the disorder, one or other remote organ, such as the brain, should become also seriously implicated, and that this should produce a diversion in favour of the part first affected, than that the disease which first existed, quitting its original seat, should wander, as it were, through the system, like an unburied ghost, till alighting on some remote organ, previously healthy, it should there manifest the symptoms of what is called a metastatic disease. The supposition savours too much of the exploded part of humoralism, to be readily admitted at the present day.

All that Mr Travers says regarding metastatic amaurosis shows it to be of the nature of an organic affection, such as congestion, inflammation, or effusion. The treatment in such cases should be directed undoubtedly against the head-symptoms, and towards the recall of the original affection, if it was an external one. The success attendant on a recall of the original affection is often remarkable, although, as happened in some of the cases narrated by Mr Travers, the amaurosis remained complete, notwithstanding that the original disorder was recalled, and the head thereby relieved.

3. As instances of what he terms *proper functional amaurosis*, that is, amaurosis depending on a peculiar condition of the retina, which Mr Travers calls palsy of that membrane, he mentions,—1. Amaurosis from over-excitement of the visual organs, 2. That from insolation.

The symptoms of proper functional amaurosis are,—1. Growing imperfection of sight, 2. Dilated immovable pupil.

It can scarcely admit of doubt, that over-excitement of the retina, such as in intense study, with reading and writing to a very late hour, in miniature painting, in the use of the microscope, in observations with astronomical instruments, and the like, when it gives rise to amaurosis, does so by congestion, inflammation, and ultimate atrophy of the optic nervous apparatus, not by any pure paralysis, or functional exhaustion; while insolation, the other cause mentioned by Mr Travers, operates upon the vessels of the brain, so as to cause, by compression of that organ, apoplectic or paralytic symptoms, and amongst these insensibility to light.

It would appear, then, that in by far the greater number of cases brought together by Mr Travers under the heads of symptomatic, metastatic, and proper functional amaurosis, the efficient cause resides in the vascular system of the optic nervous apparatus, and consists either in undue pressure, or in the want of proper support by the blood-vessels.

Mr Travers now proceeds to consider once more the symptoms of amaurosis, and sets out with the acknowledgement, that a great source of difficulty is the circumstance of many symptoms being common to the organic and functional classes. This is not to be wondered at, if amaurosis depends in every case on some organic change. The insensibility of a nerve, arising from transient congestion, may not easily, or may not at all, be distinguishable, while it lasts, from the insensibility resulting from the persisting pressure of a tumour.

1. *Headach.*—Mr Travers states pain affecting the forehead and temples to be a precursory symptom, diminishing in proportion as the dimness increases, and ceasing altogether when the amaurosis is perfect, if the disease has its seat in the eyeball. Whether the pain be characteristic of organic amaurosis must be judged of, he says, by its situation and extent, but especially by its association with other symptoms.

Pain, affecting the forehead and temples, occasionally inconsiderable, and declining as the dimness increases, is common, Mr Travers states, in some forms of functional amaurosis. But if it be severe, remitting imperfectly, immediately increased by exercise, whether diffused over the entire side of the head, or circumscribed to a small space corresponding to the anterior cerebral lobes, it is usually connected with organic change within the head. In this case, derangement and torpor of the *primæ viæ*, loss of strength and flesh, disposition to stupor, occasional confusion of intellect, inaptitude to exertion, and paralysis of one or more muscles, will be concomitant symptoms.

2. *Tenderness of Scalp.*—Mr Travers has met with cases "clearly depending," he says, "on cerebral disease or irritation, in which the scalp was universally tender even to soreness." The expression "cerebral disease or irritation" includes, it may be presumed, both functional and organic affections, according to Mr Travers' classification, so that this symptom is diagnostic of neither.

3. *Neuralgia.*—Mr Travers notices an intermittent pain accompanying some cases, shooting through the orbit into the head,

of acute and distressing severity. It makes its attack, he says, at or about the same hour every night, or every second night, continues for several hours, and is accompanied with convulsive quivering of the muscles of the eye and eyelids, and profuse lacrymation. This is neuralgia affecting certain branches of the fifth nerve.

Neuralgia is not, properly speaking, a symptom of amaurosis. It is merely an occasional concomitant. It occurs much more frequently as an independent disease than as an accompaniment of any imperfection of sight. When neuralgia and amaurosis have co-existed, I have repeatedly found that as the former yielded to appropriate means, the latter was removed at the same time. In such cases the amaurosis was probably a vascular and reflex affection, excited by the state of the fifth nerve. Where the disease of the fifth nerve and second nerve resists the usual means of curing neuralgia, some exostosis of the inner table of the skull, deposition on the *dura mater*, or tumour in the brain, may be suspected.

4. *Paralysis of the Levator of the Upper Eyelid.*—Mr Travers tells us that palsy of the levator is a sign of cerebral pressure, always accompanied by some degree of imperfect vision, and with so much vertigo that the patient is in danger of falling if the affected eye be uncovered. He ascribes the vertigo not to the double vision of the patient, which is a symptom he does not notice in this place, but to near objects appearing remote and much diminished in size, as if seen through an inverted opera-glass, an illusion which, he says, is usually removed by depletion. I cannot say that I have heard any patient mention this illusion. Mr Travers states that the pupil is over-dilated, and does not recover its activity proportionally with the recovery of vision. He had seen both levators affected with palsy in succession, each for a day or thereabouts, and in this case the blindness supervened upon the removal of the ptosis.

It is remarkable, that Mr Travers says nothing of the third nerve, as being the one affected in ptosis, nor of the paralytic state of the other muscles of the eye, animated by the third nerve, nor does he refer the dilated state of the pupil to a paralytic state of the iris, produced by the implication of the ciliary nerves, derived from the third nerve. Neither does he trace the ptosis and mydriasis, (for it is much more mydriasis than amaurosis, which is present in such cases, as is shown, in an instant, by making the patient look through a pinhole), to the most frequent exciting cause, viz. exposure to a draught of cold air while overheated; but he tells us, what may be very true in certain cases, that ptosis follows injuries of the head and top of the spine. To the train of symptoms here described by Mr Travers, Beer gave the name of rheumatic amaurosis, and ascribed it chiefly to the sudden and continued exposure of the head to cold while it was in a state of perspiration. *

Just as with neuralgia and amaurosis, so with the coincidence of amaurosis and palsy of the third nerve; if the paralytic symptoms yield, so does in general the affection of vision.

5. *Paralysis of the orbicularis palpebrarum* is a less frequent attendant, Mr Travers says, on amaurosis; but of the many cases which I have seen of palsy of the muscles animated by the facial nerve, to which class the orbicularis belongs, I do not recollect one in which the disease was accompanied by amaurosis.

Mr Travers says vertigo attends palsy of the orbicularis; but this also I have never witnessed.

6. *Want of direction of the eyes.*—Mr Travers tells us, that in proportion as vision fails, the eye affected with amaurosis loses its fellowship with the sound eye, and that, owing to this loss of correspondence, persons affected with imperfect amaurosis of one eye often mistake the relative position and distance of objects, and frequently see them reflected. What is meant by seeing objects "reflected" I do not know. As to the want of correspondence of the eyes, and the mistakes in the position and distance of objects made by amaurotic patients, there can be no doubt. Porterfield has pointed out the advantage to be gained in respect to the prognosis, from ascertaining from the patient at what period he first became liable to mistakes as to distances; as, in snuffing a candle, pouring liquor into a glass, threading a needle, and the like. If he has begun to make such mistakes only recently, the disease is not of long standing, and the hope of a cure greater.

Mr Travers observes, that in perfect amaurosis the inexpressiveness or vacancy of countenance depending on the non-convergence of the optic axes, is too remarkable to escape an ordinary observer, especially if both eyes are affected. "The patient," says he, "has either a fixed unmeaning stare, or a constant rolling motion of his eyes. The loss of association in strabismus results from a relative debility of one of the straight muscles; and if both eyes are employed, is generally accompanied with double vision; but that which I have just described is in no degree depending upon loss of muscular energy, partial or general, direct or indirect, but on the total failure of sensation, by which the actions of all the muscles subject to the will are directed."

With respect to these statements of Mr Travers, it may be remarked that constant oscillation of the eyes is rarely attendant, except on congenital amaurosis. As to strabismus, when we see the squinting eye instantly resume its natural place and power of motion merely on the patient's closing the good eye, we cannot assent to the opinion of Mr Travers and others, that the cause of the distortion is "a relative debility of one of the straight muscles." The cause lies deeper. One thing must not be overlooked, that a squinting eye never possesses a normal degree of retinal power. This may not be the cause of the strabismus; but it scarcely admits of doubt that the deficiency of sight is intimately connected with the irregular mobility of the eye; in other words, that they both depend on one cause, and that resident in the brain.

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* Lehre von den Augenkrankheiten, Vol. ii. p. 527. Wien, 1817.

The slight strabismus divergens, which is observed in many cases of uniocular amaurosis, is worthy of particular attention in this point of view, that it generally enables the practitioner to fix on the diseased eye without asking the patient any question as to which eye is affected. It is often the sign, however, not of a general retinal failure, but of a partial amaurosis. A part of the retina only is tolerably sensible, while the rest is often quite insensible, and this gives rise to what is termed oblique vision; that is, seeing in one direction, upwards or downwards, inwards or outwards, while an object held straight before the eye, or in any other direction but one, is as it were eclipsed.

7. *Hemiopia.*—Mr Travers uses this term as synonymous with "partial impairment of the retina;" whereas there is strong reason to believe that the affection is often cerebral, pressure on the right side of the brain giving rise to the non-perception of objects, the image of which falls on the right side of the retinæ, and *vice versâ.* This view of the cause of the most remarkable variety of hemiopia, viz. the vertical, such as that with which Dr Wollaston was affected, has been much confirmed by the physiological reasonings of Mr Mayo. The horizontal variety derives no light from the presumed semi-decussation of the optic nerves.

8. *Fixed and Floating Muscæ.*—Mr Travers regards fixed muscæ as symptoms of organic, floating ones as characteristic of functional amaurosis. Fixed muscæ are extremely rare. We may not meet with one case of fixed muscæ for a thousand cases of floating ones. We must not be hastily led to the conclusion, that what the patient complains of is a fixed musca. If by careful experiments, we have ascertained that the muscæ have absolutely no motion independent of the motion of the eye, we may then set them down as fixed, and consider them as indicative of some organic affection of the retina. As for floating muscæ, they have nothing to do with amaurosis whatever, their cause exists in eyes, the retina of which is perfect, or even abnormally sensitive, and they are neither the signs nor the precursors of any diminution of visual power. Every one sees, or may see floating muscæ, except amaurotics. Mr Travers remarks that their magnitude diminishes as the distance is increased, to those who see them at all distances; which is exactly the reverse of the fact.

9. *Ocular Spectra.*—Mr Travers' statement, that "coloured spectra, or luminous impressions of objects remaining upon the

retina, are usually preceded by the fixed muscae, and may then be regarded as a more advanced stage of the complaint," is one of the most extraordinary in his work. Every human being sees ocular spectra, if he but takes the trouble to look fixedly at an object, the outlines of which are marked by well-contrasted colours, and then to close his eyes. If one looks fixedly for two or three minutes at a framed print for instance, the frame being light-coloured, we shall say, and the contents dark, and then closes his eyes, a spectrum will appear to him, the frame of which will be dark and the contents light. If such a spectrum were not seen, there would be no surer sign of a commencing amaurosis. With fixed muscae, ocular spectra have no other connection than this, that if a very luminous object is regarded, such as the sun, a coloured spectrum of it will remain for days or weeks, or even lead to amaurosis, as has been known to follow the looking at an eclipse of the sun with the naked eye.

10. *Nebulous Vision.*—The next symptom on which Mr Travers touches is indisputably the most common of all the symptoms of amaurosis. He says it is a characteristic of functional amaurosis, but assuredly it attends those varieties which he would consider organic, as well as those which he would call functional. He describes it as "a thin mist, fog, smoke, or gauze," "an indefinable something," "intervening between the eye and the object, which takes off the sharp edge of clear vision." Had he added, that this indistinctness is constant and unvarying, not altered by changes of light, and relieved neither by the application of glasses, nor by rest, he would have gone a good way to define one of the most remarkable symptoms of amaurosis. But he immediately proceeds to jumble up this symptom with asthenopia—a disease, which, above all others, must be carefully discriminated from amaurosis, because the treatment likely to afford relief in most cases of amaurosis is almost sure to aggravate asthenopia.

11. *Oscillatory Vision.*—Mr Travers mentions an apparent oscillation or wavering of objects as a functional affection. That this symptom may sometimes be owing to congestion seems not improbable. It must be confessed, however, that it is not a common symptom. It occurs, perhaps, most frequently in those who have suffered from syphilitic retinitis: they call it a "flickering" of objects, and compare it to the seeing through a mass of steam, or through a vibrating stratum of heated air. It must be owing to some movement in the eye different from common oscillation of the eyeball, for we meet with many cases of this, in which no complaint is made of any apparent wavering of objects. Any degree of want of support of the retina, such as might follow softening or partial atrophy of the vitreous body, or any loosening of the elements of the retina from one another, appears likely to give rise to oscillatory vision.

12. *Loss of adjusting power* is enumerated by Mr Travers as an occasional symptom of functional amaurosis. That amaurotics become in some instances extremely presbyopic, in others extremely myopic, is a fact deserving to be noted. Unquestionably, neither is the presbyopia nor the myopia a functional affection—neither of them depends on the state of the optic nervous apparatus—neither of them is a symptom of amaurosis—but only a coincident. Presbyopia and myopia must depend either on a change in the form or density of the refractive media of the eye, or on a loss of the power which the normal eye possesses of accommodating its dioptric parts to the different distances of objects. Mr Travers refers the presbyopia and myopia which occur in different amaurotic patients to the state of the retina, which is an impossibility. An amaurotic may see better when an object is held at arm's length than when it is held nearer him, or *vice versâ*, but this loss of focus is not a sign of amaurosis, but only a coincidence. If the loss of focalizing power is perfectly compensated by using convex or concave glasses, and distinct vision thereby restored, the patient is not amaurotic. An amaurotic retina can derive no benefit from glasses, but an amaurotic patient may, by the correction which they afford of a coincident presbyopia or myopia. I cannot admit that the presbyopia or myopia of an amaurotic eye can depend indirectly, as Mr Travers asserts, on a loss of vigour in the retina. A loss of the power of adjustment, as in asthenopia, and an amaurosis, may exist together, and even originate in the same exciting cause, but assuredly the one cannot spring from the other. I have known many cases of loss of focalizing power mistaken and treated for amaurosis. If, by means of glasses, a defective adjustment is perfectly corrected, there is nothing wrong with the retina, functionally nor organically. If the correction by glasses is incomplete, or null, so that the patient sees just as well without glasses, or perhaps better, and we have ascertained by careful examination that there is no opacity in the media of the eye, there must be an amaurotic affection present, but this may be organic, even in Mr Travers' sense of the term, just as readily as vital or functional.

From a perusal of what Mr Travers has written on amaurosis, every reader must derive a large share of practical instruction; but as to a distinction of the disease into functional and organic, I think it must be granted that the author has failed to establish it. I have given the above pretty full analysis of Mr Travers' views of the subject, in order that we might form a distinct idea, if possible, of the nature of what he terms functional amaurosis—of a disease depriving the patient of sight although the organ of sight was sound. We have found, however, that there are no diagnostic marks by which his functional amaurosis can be distinguished from his organic; and that, except where he attributes the varieties, which he calls functional, to such obscure causes as an exhaustion or suspension of sensorial power, they are attributable to determination of blood, vascular congestion, or hyperæmia, or of vacuity or anæmia, morbid conditions of the organs of circulation, which not only involve changes in the structure of the blood-vessels, but which, there is reason to believe, are often, if not always, preceded by molecular changes in the parts to which the hyperæmic or anæmic vessels are distributed.

Although the distinction of amaurosis, or, indeed, of any disease, into functional and organic, is to be rejected as irrational, are there no other distinctions, it may be asked, which, being founded on philosophical principles, are worthy of being known and received? Of such distinctions there are several, on the consideration of which I hope to enter at some future opportunity.

Amaurosis being a symptom indicative of various pathological conditions of different portions of the optic nervous apparatus, a chief matter is to determine, if possible, from the progress and character of the loss of sight, and the concomitant signs of disease, the seat and the nature of the organic affection, to which the phenomena are to be referred. The distinctions of amaurosis, depending on whether the organic cause operates immediately or mediately on the optic nerve, and whether the morbid affection has been excited by causes acting directly or indirectly on the organ of vision, have always attracted attention. Over-exertion of the eyes, for example, will cause what is termed an *idiopathic* amaurosis; disease of the uterus, acting reflectively on the brain may cause a *sympathetic* amaurosis; a tumour of the *dura mater* pressing on the neighbouring parts may produce a *symptomatic* amaurosis. Not only do the organic changes which produce amaurosis differ in degree, sufficing sometimes to impede only partially, or for a time, the function of vision, while in other cases they utterly and for ever extinguish it; but the seat of the organic changes are also different, sometimes involving the *central*, sometimes the *peripheral* portions of the optic nerves, sometimes affecting in the first instance only the *nutrient* and *protective* parts of the nervous apparatus of vision, while in other cases there is reason to suspect that they reside in the *essential* parts—the parts in which the organic change, whatever be its nature, takes place, which the stimulus of light produces, and upon which depend the phenomena of healthy vision. These and various other considerations of a similar kind, give rise to distinctions of amaurosis of the highest importance, on the illustration of which I cannot now enter, my present object being confined entirely to the exposure of a distinction which I consider to be ill-founded. If I have succeeded in this object I may be permitted to say, with Horace,

> Est quôdam prodire tenus, si non datur ultrà.

Glasgow, 28th July 1851.

ART. IV.—*Observations on the Dumb-Bell Urinary Deposit.* By JOHN BACON, Jr., M.D. (Read before the Boston Society for Medical Observation, December 16th 1850.) (American Journal of Medical Sciences, April 1851, Number 42d, p. 297.)*

THE remarkable crystalline bodies, first described by Dr Golding Bird, in 1842, under the name of *dumb-bells* (see Guy's Hospital Reports, vol. vii.) are among the rarer forms of urinary deposit. Their nature has never been satisfactorily determined. They always occur alternately with the octohedra of oxalate of lime, or mixed with them; and were regarded by Dr Bird as zeolitic crystals of that salt. The term *zeolitic* is derived from the zeolites, a family of minerals which frequently form compact spherical masses made up of radiating acicular crystals. In the American Journal of the Medical Sciences, for July 1850, is an article on the dumb-bells, by Dr Frick, of Baltimore, in which he endeavours to prove that they consist of uric acid. The question as to their chemical composition is not only one of scientific interest, but of practical importance in its bearing on the treatment of oxaluria, an affection which is probably much more frequent than is generally supposed. A fine specimen of the deposit, for which I am indebted to Dr Dalton, of Boston, has enabled me to make a microscopic examination, and a partial analysis.

In this specimen, the dumb-bells are mixed with octohedral crystals of oxalate of lime, generally very small, and some epithelium cells. They were prepared for examination by allowing the urine containing them to stand an hour or two, as the deposit subsides slowly; and after pouring off nearly the whole fluid, adding distilled water to the remainder. After another interval of repose, this process was repeated; first with water, and subsequently with dilute alcohol, in which the deposit falls more readily, until the last portions left no stain when evaporated on a slip of glass. Both the dumb-bells and octohedra are insoluble in water and in alcohol.

I. *Microscopic Characters of the Dumb-bells.*—The microscope employed is a very excellent one, made by Charles A. Spencer, of Canastota, N. Y. I have since repeated the observations on mounted specimens, with a first-class microscope recently made by Nachet, of Paris, with the same results.

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* This paper by Dr Bacon contains a very elaborate and apparently correct and faithful account of the dumb-bell crystal deposit. The author has at the close of his own remarks given an abstract of those of Dr Golding Bird, formerly noticed in the seventy-fifth volume of this Journal, (p. 243). This has led to some repetition; but as the observations of Dr Bacon are instructive, readers will most likely not be displeased at seeing them given without abridgement. We are glad to perceive that Dr Bacon has given proper attention to the zeolitic form of these crystals; a character that was overlooked by all except in this Journal.

The dumb-bells, mounted dry, and examined by reflected light, are yellowish-white and semitransparent, with a pearly lustre. The surface is slightly roughened by minute tubercular projections. In Canada balsam or in water they appear by transmitted light nearly transparent and free from colour, excepting a yellow tinge. The general form is that of a dumb-bell. Many specimens have the shape of two kidneys with their concave surfaces opposed and connected by a short band. This form passes into that of a nearly circular body composed of two semicircles, nearly or quite in contact, but united only by a narrow neck. Every intermediate form between this and the dumb-bell can be found. There are also nearly circular bodies made up of four quadrants, united at the centre.

The striæ described by Dr Bird are readily seen. They radiate in two general and opposite directions from a central point in the neck of the dumb-bell, and run without interruption to the surface of the heads, which is slightly tuberculated, but shows no projecting crystalline points. The striæ are composed of exceedingly fine and close lines, and become more and more curved, as they are farther from the axis of the dumb-bell. Besides the striæ, there are faint concentric bands parallel to the outline of the heads, and generally at right angles to the striæ. These are marked by lighter and darker shades of colouring, and are most distinct near the exterior. Usually four or five are visible; sometimes as many as eight. They are present in the small specimens as well as the large, and can sometimes be traced nearly to the neck of the dumb-bell. In the nearly circular bodies they have the same characters. They probably indicate successive deposits or interruptions in the process of formation, like the concentric layers in calculi, which often exhibit a radiated structure also. The striated portion of the neck is generally surrounded by a more transparent substance, showing no structure, which fills up more or less of the interval between the heads. Specimens examined in the urine itself had the same characters.

The above is the appearance of the dumb-bells in their usual position. In thick and fluid Canada balsam, they can be rolled over and examined in different positions. In a side view the general outline is oval, the very transparent substance nearly or quite filling the space between the heads, which are considerably narrower than when seen in front. The striated portion presents the figure of an hour-glass, the striæ diverging from a central point within the transparent envelope. The concentric bands present the same appearance as in a front view. The heads are not spherical but considerably flattened, and the end view of the dumb-bells is oval, but they cannot be retained in this position long enough to be clearly seen. Some of the specimens mounted in solid Canada balsam show an oval figure, with striæ diverging in every direction from the centre, and are probably dumb-bells seen endwise. The nearly circular bodies appear as spheroids more or less flattened in a side view.

II. *Size of the Dumb-bells and Octohedra.*—The dumb-bells in this specimen are considerably larger than those measured by Dr Bird. In the following table are given his measurements in fractions of an English inch (taken from his work on "Urinary Deposits"), for comparison with mine. The first column of figures is Dr Bird's, and the second my own measurements.

Long diameter of large dumb-bells, .	$\frac{1}{363}$.	$\frac{1}{423}$
Short diameter of ditto, . . .	$\frac{1}{780}$.	$\frac{1}{683}$
Diameter of some nearly circular bodies,	$\frac{1}{300}$.	$\frac{1}{812}$
Long diameter of smallest dumb bells, .	$\frac{1}{1480}$.	$\frac{1}{940}$
Short diameter of ditto, . . .	$\frac{1}{2300}$.	$\frac{1}{1387}$
Length of a side of largest octohedra, .	$\frac{1}{750}$.	$\frac{1}{879}$
" " smallest octohedra,	$\frac{1}{3000}$.	$\frac{1}{7700}$

There are very few large octohedral crystals in this specimen; their average size is about $\frac{1}{1000}$th of an inch. My measurements were made with both an English and a French micrometer, which agreed very nearly.

III. *Action on the Dumb-bells on Polarizd Light.*—Examined by the polarizing attachment of a Chevallier microscope (consisting of two Nicol's prisms), the dumb-bells appear brilliantly illuminated on the dark field, exerting a powerful action on the polarized light. The heads exhibit concentric coloured bands traversed by a dark cross, an appearance commonly presented by groups of radiating acicular crystals. These coloured bands are most distinct near the exterior, and do not appear to coincide with the structural bands seen in ordinary light. The transparent substance investing the neck polarizes feebly. In the side view an oval coloured band is seen near the outside of the dumb-bell, and the hour glass striated portion is distinctly visible within its transparent envelope. The oval bodies which I suppose to be dumb-bells, seen endwise, show one or two nearly circular coloured rings near the centre, and an oval band near the outside. The nearly circular bodies exhibit concentric coloured bands within each segment, and are traversed like the dumb-bells by a dark cross. When the field is made bright by revolving one of the Nicol's prisms 90°, the cross becomes white, and the coloured bands are faintly visible, their colours being complementary to those exhibited on a dark ground. The accompanying octohedral crystals are nearly invisible on the dark field, exerting little or no action on polarized light.

IV. *Chemical Reactions of the Dumb-bells.*—The dumb-bells were submitted to the microscope without separation from the accompanying octohedra and epithelium cells. For the micro-chemical examination, they were freed from them as far as possible by diffusing the deposit in water in a watch-glass. A rotatory motion being given, the water was poured off as soon as the dumb-bells had settled to the bottom. Being larger and apparently heavier, they subside more quickly than the rest of the deposit. The few remaining octohedra were nearly all picked out under the microscope.

Experiment 1.—The dumb-bells, heated over a spirit lamp, on a slip of the thin glass used for covering microscopic objects, darken and finally become white again at a low red heat. Under the microscope, they are now opaque, but preserve their shape perfectly. The residue is insoluble in water, as before heating. In dilute acetic acid, it dissolves with effervescence. The solution, supersaturated by ammonia, gives no precipitate. Solution of oxalate of ammonia being added, a white granular precipitate falls, and, after some time, small octohedral crystals appear in the solution.

Experiment 2.—Heated before the blowpipe, on a strip of platinum foil, the dumb-bells become opaque and retain their shape without sign of fusion, even at a full white heat. A pointed slip of reddened litmus paper being moistened and brought in contact with a little heap of the ignited dumb-bells, its blue colour is restored at the tip. Dilute acetic acid dissolves the residue without effervescence. The solution gives with oxalate of ammonia a white precipitate composed of very minute octohedra.

Experiment 3.—Dilute acetic acid does not dissolve the dumb-bells. In tolerably strong acetic acid (containing 39 per cent. of glacial acid), they become very pale and transparent, the transparency commencing at the surface, and slowly penetrating to the centre of the heads. The striæ and concentric bands all disappear, and a transparent substance is left which retains the form of the dumb-bell for a while. In half an hour complete solution is effected. The solution, left to spontaneous evaporation, deposits an abundance of zeolitic forms. They are mostly circular, and are generally composed of two semicircular bodies united by a narrow neck. Every intermediate form exists between this and the dumb-bell, of which there are many small specimens. All these bodies exhibit fine radiating striæ, but none of the concentric layers present in the original dumb-bells; nor have they the transparent substance investing the neck. There are some small oblong bodies composed of two oval zeolitic forms united by a transparent substance; sometimes four of these ovals are connected in the shape of a cross. In polarized light all these bodies exibit the coloured rings and dark cross more distinctly than the original dumb-bells, forming splendid objects for the polarizing microscope. Mixed with the zeolitic forms are a few groups of long four-sided prisms, which polarize rather strongly. The result of this experiment is in perfect agreement with Dr Bird's supposition, that the dumb-bells are zeolitic groups of crystals.

Experiment 4.—In dilute hydrochloric acid, the dumb-bells dissolve slowly and completely. The solution, on spontaneous evaporation, leaves groups of thin rhomboidal plates very transparent and polarizing powerfully. The rhomboids are often very long and arranged in stellate groups. These crystals are permanent in the air, and retain their transparency when thoroughly dried by a moderate heat. At a temperature above 200° F., they become opaque and white. In water, they instantly become opaque, retaining their form more or less completely. The water reddens litmus paper; and when heated in a concavity in a glass slide, covered by a slip of glass moistened with a solution of nitrate of silver, a white cloud appears in the silver solution, which is insoluble in nitric acid, but instantly disappears on adding an excess of ammonia. This reaction proves that the rhomboids contain hydrochloric acid in combination. They are readily soluble in acetic or hydrochloric acid.

Experiment 5.—In strong hydrochloric acid the dumb-bells dissolve readily. By spontaneous evaporation, many transparent rhomboidal tables, often in groups, are deposited; resembling those from dilute hydrochloric acid, and polarizing powerfully. There are also a few octohedra, which do not act on polarized light; and some small zeolitic bodies. These are mostly circular, and have the same characters as those deposited from the solution in acetic acid.

Experiment 6.—The dumb-bells, placed in a cold saturated solution of carbonate of soda (covered to prevent evaporation), gradually become opaque, and in a few hours disintegrated, while a white granular precipitate forms around them. The clear solution being poured off, and the precipitate washed with distilled water, to remove the remaining carbonate of soda, it dissolves with effervescence in dilute acetic acid, leaving a few partially decomposed dumb bells. The acetic solution, neutralized by aqua ammoniæ, yields a white granular precipitate with oxalate of ammonia, proving the precipitate from the carbonate of soda solution to be carbonate of lime.

Experiment 7.—The carbonate of soda solution (Exp. 6) should contain the acid of the dumb-bells in combination with soda. Left to spontaneous evaporation, it affords small stellate and foliaceous groups of crystals, mixed with large isolated crystals of carbonate of soda. The whole deposit re-dissolves in water. Neutralized by nitric acid, the solution gives with nitrate of silver a white precipitate, soluble in ammonia and in nitric acid. This precipitate fails to give the characteristic reaction of oxalate of silver, which should fulminate faintly and be dispersed, when suddenly heated after thorough drying; but its quantity is too minute to render the trial satisfactory.

The small amount of the deposit in my possession was now exhausted. Experiments 1 and 2 prove that the dumb-bells consist of a salt of lime, convertible by a moderate heat into the carbonate, and of course by a high heat into caustic lime. The other reactions indicate that the lime is combined either with oxalic acid, or an organic acid nearly related to it. Octohedra, and prisms which appear to be oxalate of lime, are obtained from the hydrochloric and acetic solutions. The manner in which the dumb-bells are first penetrated, and then dissolved by strong acetic acid (Experiment 3), suggests the idea that they may contain organic matter, either as a constituent of the compound (from which it is set free by acetic acid), or mechanically intermixed with the acicular crystals which make up the zeolitic group. The acid appeared to dissolve out the salt of lime, leaving an amorphous substance of great tenuity, and less readily attacked by it. The solution did not dry up completely when the zeolitic bodies were deposited, but remained viscid after being kept for twelve hours in a closed vessel with caustic lime. Groups of acicular crystals are very liable to retain some of the substances among which they are formed, and especially in crystallizing from the urine. I have obtained tufts of acicular crystals of phosphate of lime from urine, which, after careful washing, retained organic matter enough to blacken and evolve a strong odour when heated before the blowpipe. The quantity of the dumb-bells which I exposed to heat was very small, and no odour was perceived, nor any greater blackening than is usual with pure oxalate of lime. Some of the reactions obtained are not known as belonging to oxalate of lime, and I proceeded to make some comparative micro-chemical experiments with that substance.

V. *Chemical Reactions of Oxalate of Lime.*—Pure oxalate of lime was prepared by adding oxalate of ammonia to a solution of chloride of calcium, and washing the precipitate thoroughly.

Experiment 8.—Oxalate of lime dissolves in very small proportion in dilute acetic acid, which leaves on evaporation a minute granular deposit. In acetic acid containing thirty per cent. of glacial acid, it is more soluble, a few circular zeolitic bodies appearing on evaporation. Acid of thirty-nine per cent. slowly dissolves a considerable amount, and when evaporated rapidly by a moderate heat, leaves circular zeolitic bodies, showing the radiating striæ finely, and giving the characteristic coloured rings and dark cross in polarized light. The circles are generally fissured in a radial direction in one or two places, as if they had contained water or acid when formed, and had contracted on drying. They sometimes show two or three concentric layers, proving that these may be formed in a short time, even in a few minutes. The octohedral crystals of oxalate of lime which accompany the dumb-bells in the urinary deposit are slowly dissolved by strong acetic acid.

Experiment 9.—A solution of oxalate of lime in strong hydrochloric acid evaporated rapidly, leaves an abundance of zeolitic forms like those from the acetic acid solution. By spontaneous evaporation it yields transparent rhomboidal plates, often in groups; small octohedra and four-sided prisms, which last are sometimes in rosettes and numerous zeolitic forms. The rhomboids and zeolitic groups polarize finely, the prisms less strongly, and the octohedra not at all. In water, the prisms and octohedra, as well as the zeolitic bodies, remain unaltered. The rhomboidal crystals retain their transparency when thoroughly dried, but become white and opaque on exposure to a considerable heat. They are not deliquescent, as would be the case if any chloride of calcium were formed. In water they instantly become opaque and granular, but do not dissolve. Their angles become rounded, and minute octohedra gradually appear in the water around them. In nitric acid they dissolve readily, and nitrate of silver produces a white flocculent precipitate of chloride in solution, proving that these crystals contain hydrochloric acid combined with oxalate of lime, the combination being so feeble that the addition of water is sufficient to break it up. The prisms and octohedra appear to be pure oxalate of lime. A solution of oxalate of lime in dilute hydrochloric acid leaves, on spontaneous evaporation, rhomboidal plates, octohedra, and prisms, but no zeolitic forms.

Experiment 10.—Pulverized oxalate of lime being added to a saturated solution of carbonate of soda, and allowed to stand four hours in the cold, the deposit, which had become semi-transparent and crystalline, was separated by a filter from the solution, and washed. Dilute acetic acid now dissolves more than one-half of it with active effervescence, the residue being undecomposed oxalate of lime. The filtered carbonate of soda solution, neutralized by nitric acid, gives with nitrate of silver an abundant white precipitate, readily soluble in nitric acid and in aqua ammoniæ. This precipitate, collected and dried, is dispersed with a faint report and a puff of smoke when suddenly heated on platinum foil. This is a characteristic reaction of oxalate of silver, and proves that a solution of carbonate of soda is able to decompose oxalate of lime without the aid of heat, giving rise to insoluble carbonate of lime and soluble oxalate of soda.

These experiments show that oxalate of lime, contrary to the usual statement, is soluble in strong acetic acid, and that it forms a crystalline compound with hydrochloric acid. When rapidly deposited from solution, it affords zeolitic forms similar to those obtained from the dumb-bells. By the slow evaporation of a strong solution, zeolitic groups mixed with crystals are deposited. A dilute solution, slowly evaporated, yields crystals only. These crystals resemble in appearance and in their reactions those obtained from the dumb-bells.

It is probable that many substances may assume the zeolitic form of crystallization, and even the dumb-bell variety of that form. Griffith, in his Manual on the Blood and Urine, figures dumb-bells of oxalate of soda (Plate IV. Fig. 17), also imperfect dumb-bells of uric acid (Plate I. Fig. 12). I have similar forms of phosphate of lime from stale urine, of urate of magnesia and oxalurate of ammonia, which are evidently made up of radiating acicular crystals. The mere external shape is not to be regarded as characteristic, unless the zeolitic structure is present also. Dr Frick obtained forms similar to the dumb-bells by keeping rhomboidal crystals of uric acid in water for some time, but it does not appear that they acquired the radiated structure or the polarizing action of the true dumb-bells. The well known radiated spherical masses of carbonate of lime from the urine of the horse give the zeolitic rings and cross in polarized light. Phosphate of lime, dissolved in strong hydrochloric acid affords, both by rapid and slow evaporation, circular zeolitic forms, having the characteristic structure and polarizing action. No isolated crystals are obtained from the hydrochloric solution of this salt. The typical zeolitic form is a spherical mass. Under what conditions the peculiar dumb-bell shape is assumed has not been ascertained. The concentric layers which I observed may not be present in all cases.

Since the preceding observations were made, I have seen, in the London Medical Gazette of Oct. 25th, 1850, a reply by Dr Bird to Dr Frick's article. In this paper Dr Bird gives the results of a few recent experiments on dumb-bells obtained from a patient whose urine deposited a large quantity of them unmixed with other crystals. These experiments, in his opinion, render it probable that theyconsist of oxalurate of lime, a salt easily convertible into the oxalate; from which it differs only by containing the elements of urea in place of those of water. The following is an abstract of his reasons for this belief, *1st*, In their peculiar action on polarized light and their radiated structure, they present a close resemblance to the crystals of oxalurate of ammonia, while the octohedra of oxalate of lime have no polarizing power. *2d*, Water in which dumb-bells were kept for ten days at a temperature which, in the day time, seldom fell below 85° or 90° (Exp. B.), became turbid, and evolved a fetid ammoniacal odour. Some of the dumb-bells had disappeared, and large octohedra of oxalate of lime, which did not exist previously, were visible. This putrefactive change, with evolution of ammonia, indicates the presence of nitrogen. *3d*, The dumb-bells became black; and evolved an odour of burnt horn, when heated in a platinum spoon (Exp. D.), and at a moderate red heat became white. *4th*, A solution of the dumb-bells in dilute hydrochloric acid was treated by ammonia (Exp. C.), which produced an amorphous white precipitate. On leaving the whole to spontaneous evaporation, large cubes of sal-ammoniac were obtained, and none of the usual plumose crystals. The cubic form is that assumed by this salt in the presence of urea. *5th*, Boiled in strong nitric acid, (Exp. F.), the dumb-bells dissolved, and on spontaneous evaporation, large and perfect dumb-bells were deposited from the solution.

In regard to Dr Bird's argument from the crystalline form, and polarizing action of the dumb-bells, I have shown that oxalate of lime and other salts can be obtained in various zeolitic forms, of which the dumb bell is one variety. Though the octohedra of oxalate of lime do not act on polarized light, the prismatic crystals of this salt which abound in various plants possess strong polarizing power. These crystals (known to the botanist under the name of *raphides*) are classed under three general forms, specimens of each of which I have examined in this connection; *1st*, isolated four-sided prisms, usually and perhaps always rhomboidal; *2d*, stellate groups of prisms; *3d*, acicular crystals, either isolated or in bunches. Isolated prisms from the bark of common hickory, of two species of oak, and of the grape vine, become strongly coloured in polarized light, and in some positions show concentric coloured bands parallel to the edges of the crystal. Similar crystals occur in the cells of the outer coats of the onion. In a single specimen, I found mixed with the prisms groups of radiated acicular crystals and true zeolitic forms, which gave the characteristic coloured rings and dark cross in polarized light. Whether these bodies consist of oxalate of lime or some other salt, I am unable to say. They have a yellowish colour and show radiating lines distinctly, by which they are readily distinguished from starch granules, which also exhibit a dark cross in polarized light. The stellate groups or rosettes which abound in rhubarb root polarize finely, the projecting faces of the crystals showing coloured bands parallel to the edges. In the pulp of the fig similar groups of crystals occur, which have the same characters. Acicular raphides from the pith of the grape-vine, and those found in the outer coats of the hyacinth bulb, also in the stem and roots, show fine colours in polarized light. They appear to be very long and slender four-sided prisms. The prismatic crystals obtained by evaporating a solution of the dumb-bells or of oxalate of lime in acids, agree in appearance and polarizing action with those from plants. Octohedra of oxalate of lime sometimes occur in plants. I regard the dumb-bells as made up of very slender prisms, and not of lengthened octohedra, as Dr Bird supposed.

Dr Bird's experiments B and D indicate the presence of organic matter containing nitrogen, but do not show whether it forms a chemical constituent of the salt of lime, or is mechanically mixed with it. The resolution of the dumb-bells into octohedra of oxalate of lime, observed in Exp. B., may be a recrystallization of the salt, with separation of the organic matter, or the acid may be decomposed. In Bowman's Medical Chemistry, it is stated that the dumb-bells are gradually converted into octohedra if kept for a length of time in any liquid medium. In my fifth experiment, octohedra were deposited from the hydrochloric solution of the dumb-bells. Exp. C favours Dr Bird's opinion that the elements of urea are present, but it cannot be regarded as conclusive. It is yet unknown whether sal-ammoniac may not assume the cubic form in presence of other organic substances besides urea. I repeated this experiment with some dumb-bells which had been mounted dry for preservation, and obtained plumose crystals of sal-ammoniac, and no cubes. It is possible that these dumb bells might have undergone some alteration, as they were exposed to a heat of 200° or more in mounting, and had been kept some time since; but they retained their transparency and other characters.

A dilute solution of oxalurate of ammonia, added to one of chloride of calcium, produces no immediate precipitate, but after some hours numerous zeolitic forms, probably of oxalurate of lime, are deposited. Among them are small dumb-bells, with radiating striæ, but the majority are circular. A part of the solution, left to spontaneous evaporation, deposited large cubes of sal-ammoniac mixed with zeolitic groups. The oxalurate of ammonia employed was not pure, and the zeolitic bodies are coloured, and more or less opaque, but some of them give the characteristic phenomena in polarized light. They are too impure and too small in amount for a satisfactory comparison of their reactions with those of the dumb-bells. Pure oxalurate of lime is stated to form brilliant and colourless crystals, sparingly soluble in water. The dumb-bells from urine are not attacked by water unless macerated in it for a long time.

Dr Bird concludes, from Exp. F, that the dumb-bells are not decomposed by boiling in strong nitric acid; but they might give this result if they consisted of oxalate of lime, or were converted into that salt by the nitric acid. A solution of oxalate of lime in strong nitric acid affords fine zeolitic forms by rapid evaporation. If these are re-dissolved in strong acid, and the solution boiled and evaporated, they are again deposited with the same characters. The residue is not deliquescent, as would be the case if any nitrate of lime were formed.

The preceding observations prove that the dumb-bells consist of a salt of lime, containing either oxalic, oxaluric, or perhaps some other organic acid easily converted into the oxalic; but the exact nature of the acid remains to be determined by future investigation.

ART. V.—*On the Structure and use of the Ligamentum Rotundum Uteri, with some Observations upon the change which takes place in the Structure of the Uterus during Utero-gestation.* By G. RAINEY, M. R. C. S., Demonstrator of Anatomy at St Thomas's Hospital. Communicated by JOSEPH HENRY GREEN, Esq., F. R. S. Received January 15, read April 11, 1850. (Philosophical Transactions, Vol. 140, for 1850.)

PRIOR to the discovery of the striated character of voluntary muscle, about 1765, by Fontana, physiologists were unacquainted with any certain mark by which they could distinguish this variety of muscle from many other structures; and physiology being at that period in advance of anatomy, the question of the muscularity of many parts was obliged to be decided by their function instead of by their structure. But in the present state of minute anatomy, improved as it has been of late by the researches of microscopists, physiology and anatomy are made to move more in parallelism. This is especially the case with respect to the muscular system, so that if a muscle be made up of a bundle of fascicles of nearly equal size, and each one be marked transversely with parallel striæ, it is known to act either directly in obedience to the will, or to be capable of being called into operation through excito motory influence, whilst a muscle consisting merely of an aggregation of fibres more or less distinctly nucleated, is known to act independently of the will; hence muscles are now named according to their function, voluntary and involuntary; or according to their structure, striped and unstriped. In the class of striped muscles physiologists are agreed to place the voluntary muscles, the upper part of the human œsophagus, and the heart; in that of unstriped ones, the muscular coat of the intestinal canal, the bladder, the uterus, and round ligaments. As it respects the parts included in the latter division of this classification, I am obliged to dissent altogether in reference to the structure of the round ligaments of the uterus, having found in every subject in which I have examined them (the number being about a dozen) well-marked muscular fibres of the striped variety, in fact that they correspond in all respects to regular voluntary muscles: with this conviction I am desirous to communicate the result of my observations to the Royal Society. I may also add, that I have in my possession numerous preparations, microscopic as well as ordinary dissections, in which the accuracy of the facts stated in this paper are easily demonstrable.

The so-called round ligament of the uterus, regarded as a muscle, may be said to arise by three fasciculi of tendinous fibres; the inner one from the tendon of the internal oblique and transversalis near to the symphysis pubis, the middle one from the superior column of the external abdominal ring near to its upper part, and the external fasciculus from the inferior column of the ring just above Gimbernat's ligament; from these attachments the fibres pass backwards and outwards, soon becoming fleshy; they then unite into a rounded cord, which crosses in front of the epigastric artery and behind the lower border of the internal oblique and transversalis muscles, from which it is separated by a thin fascia continuous with the fascia transversalis; it then gets between the layers of peritoneum, forming the broad ligament of the uterus, along which it passes backwards, downwards, and inwards to the anterior and superior part of the uterus, into which its fibres, after spreading out a little, may be said to be inserted.

The striated muscular fibres are not confined merely to the surface of the round ligament, as if only accessory to some more important part of it, but they form almost the whole of its substance, and are more particularly distinct near to its centre; nor do they extend completely to the uterus, but after passing between the layers of the broad ligament to about the distance of an inch or an inch and a half from its superior part, they gradually lose their striated character, and degenerate into fasciculi of granular fibres mixed with long threads of fibro-cellular tissue. Plate 39, figure 1, is an accurate representation of some muscular fibres taken from the centre of the round ligament, where it is situated between the layers of the broad ligament, about one inch and a half from the uterus. Fig. 2 is also a representation of some muscular fibres taken from a part rather nearer to the uterus, showing the manner in which the striped muscular fibre terminates in the granular fibres above mentioned. This structure of the round ligaments is not, as might be expected, confined to the human species. In the monkey these ligaments are composed almost entirely of striped muscular fibre which extends all along them nearly as far as the uterus. The uterus in a monkey which I examined was very small, but the round ligaments were proportionally large: the primary fasciculi of muscular fibres were pale but very distinctly striated. In the dog, as most probably in other animals in which the uterus divides into cornua extending into the abdomen considerably beyond the brim of the pelvis, the round ligaments, instead of passing downwards to be attached to the pelvis, as they are in the human subject, in whom the uterus is situated below its brim, pass from the extremities of the cornua of the uterus upwards, or rather forwards to the last rib. Hence in these instances, these ligaments, or rather muscles, may be said to arise from the last rib, and from the aponeurosis of the diaphragm, by a thin triangular expansion, partly tendinous, and partly muscular (the fibres of the muscle being pale but of the striped kind), and to be inserted into the cornua of the uterus, having the same relation to the Fallopian tubes and ligaments of the ovaries as in the animals which have a simple uterus. In the sheep and the cow the attachments of the round ligaments are similar to those in the dog, and composed likewise of muscular fibres distinctly striated. Besides striped muscular fibres these ligaments contain numerous vessels, also some nerves and absorbents. The arterial trunks are large, but the capillaries into which they ultimately divide have the same size and arrangement as those of ordinary muscle. The lymphatics are situated on the outer side of the ligament; their glands are sometimes of considerable length, and even pass through the external abdominal ring; connecting all these parts together, there is a considerable quantity of areolar tissue, especially where the striated muscular fibres are absent, or are about to terminate. In this part the detection of these fibres will be facilitated by examining the part in glycerine, which renders the fibro-cellular tissue more transparent without impairing in any considerable degree the distinctness of the striated muscle.* It is generally said that the round ligament passes through the external abdominal ring, and "is LOST in the cellular tissue of the mons veneris and labia pudendi." It is true that the vessels supplying it, and a nerve, and some lymphatics, and frequently a gland, pass through the external abdominal ring, but the substance of the ligament is situated altogether above it so as in part to close it, and thus to tend very much to prevent the protrusion of intestine at this part, whilst it would facilitate its passage through the crural ring by directing it towards Gimbernat's ligament. Hence probably the reason why females are more liable to femoral than to inguinal hernia.

Those who have written upon the office of the round ligaments of the uterus, regarding them either as made up of muscular fibres of the same kind as those of the uterus itself, or considering them as composed merely of "condensed cellular tissue," have considered their office, either as subservient to the process of utero-gestation, or as acting merely as mechanical supports to the uterus, that is, as uterine suspensory ligaments. Now the presence of voluntary (striped) muscular fibre in these so-called ligaments, proves that neither of these suppositions is correct; since striped or voluntary muscular fibre would be as unfit for the one purpose as it would be superfluous for the other; hence there can be but little doubt that these ligaments, or rather muscles, are concerned in some way or other with the act of copulation, rather than with those changes which are so slowly induced in the uterus during utero-gestation. Considering the position of the points of attachment of the round ligaments, and the direction of their fibres, it is evident that their combined action will bring the uterus nearer to the symphysis pubis, and thus tend to draw it somewhat from the vagina, in this way increasing the length of the latter. Now the only way in which I can imagine that these changes in the position of these parts assist in sexual intercourse, is by their causing the semen to be attracted more into the upper part of the vagina and vicinity of the os uteri. [Since the communication of this paper to the Royal Society I have been informed that this opinion is not new, but that this view of the use of the round ligament had been published by M. Velpeau,* and that it is also partly in accordance with that of Maygriers.†] This supposition seems to accord with the position and attachments of the round ligaments in those animals in which the uterus extends into the cavity of the abdomen beyond the brim of the pelvis, as was noticed in the dog, the sheep, and the cow, where their action would, obviously, be the same in drawing the uterus from the vagina, and in tending to elongate the latter, as in the human subject in whom the angles of the uterus are below the level of the broad ligaments. In such an act the muscular fibres of the round ligaments could scarcely be said to be voluntary; but still they would be as much so as the other muscles concerned in the same process, that is, as those of the male organs of generation. In these instances muscles are said to act under excito-motory influence, but muscles which are thus excited have the same structure as those more obviously under the control of the will, namely, striped fibres.

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* Besides the structures just mentioned, these fibres are mixed with several pale, and much less distinctly striated ones, which resemble in all respects the tissue of the dartos. The fibres of the dartos are generally considered merely as fibro-cellular tissue, but they seem to possess characters by which they can be distinguished from other tissues. These fibres, both from the scrotum and the round ligament, the upper part especially, when examined by the microscope in water, appear to be made up of very fine threads of wavy fibre, mixed with extremely minute granules or molecules, by which their distinctness of outline is much obscured and rendered much less apparent than in the fibres of common areolar tissue; they are also more collected into bundles than is fibro-cellular tissue; but these same fibres, when examined in glycerine, become corrugated, resembling somewhat striped muscle; in some instances, indeed, the resemblance is so great, that it is difficult, if not impracticable, to distinguish between a bad specimen of striped muscular fibre and a good one of this tissue. Common fibro-cellular tissue is not corrugated by glycerine, but only rendered more transparent.

The distance to which the striped fibre extends towards the uterus, and the degree of its distinctness, differ very much in different subjects; in one subject I found it not more than an inch from the uterus. In the employment of glycerine to aid the detection of striped muscle and the corrugated tissue, it is sometimes necessary to allow these structures to remain in the glycerine a few minutes before its full effect is produced.

Some observations upon the change which takes place in the Structure of the Uterus during Utero-gestation.

The fasciculi of fibres composing the upper part of the round ligament separate as they approach the fundus of the uterus, become spread out over its surface, and ultimately blend with its fibres. Although the fibres of the round ligament are generally said to be of the same kind as those of the uterus, I have not been able to perceive much similarity, either with those of the unimpregnated or the impregnated uterus, the fibres in both these states of the uterus being peculiar. The proper tissue of the unimpregnated uterus is so remarkably dense that there is considerable difficulty in unravelling it sufficiently to display the true character of its fibres, and sections thin enough to admit of being seen as a transparent object by the microscope, give no distinct idea of its real nature. Its characters can be best understood by breaking up portions of the uterus with needles, and examining them in glycerine, but still they should be first seen in water; also the arteries of the uterus should be fully injected (these are remarkably tortuous, and possessed of very thick coats), otherwise the tissue of the small vessels, and the nuclei in the coat of the capillaries, may be examined instead of, and mistaken for, the proper fibre of the uterus. Any part of the unimpregnated uterus, after having been thus treated, will be seen to be made up of fusiform nucleated fibres, contained in a matrix of exceedingly coherent granular matter; these are well represented in fig. 3. The average breadth of one of these fibres, at its dilated or nucleated part, is about $\frac{1}{4000}$th of an inch; their length cannot be ascertained with certainty, as it is impossible to estimate the degree of curtailment which they suffer in being separated from the granular matrix in which they lie imbedded. Their structure and size are about the same in every part of the uterus from which I have taken.them, so that they are easily recognizable as the peculiar fibres of the unimpregnated uterus. Now comparing these fibres with those forming the walls of the impregnated one, at the full, or at a very advanced period of impregnation, it will be seen that these fibres are become greatly increased in size, deprived of nuclei, and more loosely connected together; they lie in separate planes, which cross each other in various directions; they are accompanied with vessels of various sizes, also with more or less fibro-cellular tissue. The size of these fibres is moderately uniform, but those near to the external surface are rather smaller than those more deeply seated. A fibre detached from the rest measured about $\frac{1}{40}$th of an inch in length and about $\frac{1}{2000}$th in breadth at its widest part; for the breadth varies much in different parts of the same fibre, being alternately large and small; at their extremities they taper off to a very fine point; their colour is yellowish, and when minutely examined, they appear to be made up of very small irregular granules and extremely slender threads blended together without any definite arrangement (see fig. 4). Acted upon by acetic acid they give no indication whatever of being nucleated, therefore, in this respect, they differ from the common form of organic muscular fibre.* The two kinds of fibres, represented in figs. 3 and 4 were both drawn under the same magnifying power, in order to show, by a comparison of their dimensions, that the increase which takes place in the individual fibres in these different states of the uterus, is quite sufficient to account for the amount of augmentation of the entire organ, without supposing, as some physiologists do, that organic muscular fibres, not present in the inactive state of the uterus, are absolutely formed during the various stages of its enlargement; it also, besides being supported by the fact just stated, perfectly accords with the laws of development, and harmonizes with the changes which are going on simultaneously in the walls of the impregnated uterus and its contents; the unimpregnated uterus being, according to this notion, little more than an assemblage of embryonic nucleated fibres, wholly inactive, until after the reception of the ovum, when, being aroused by an appropriate stimulus, they are called into active operation, and become developed simultaneously and proportionally to the development of the fœtus contained within it, so that when the one has arrived at a state requiring to be expelled, the other has acquired the utmost degree of fitness necessary to effect its expulsion. Now after the expulsion of the fœtus, since, according to the laws of development, it is as impossible that these fibres of the impregnated uterus can return again to their primitive or embryonic condition, as that a full-formed fœtus could relapse into the state of an ovum, they must necessarily become absorbed, and therefore a new set of embryonic fibres would require to be formed for the expulsion of the next ovum, so that each fœtus will have, according to this conclusion, its own peculiar expulsory fibres. This view is perfectly in accordance with the late researches of Drs Sharpey and Weber on the membrana decidua; and it agrees with the same function in vegetables, in which the part corresponding to the uterus in animals is always cast off after its contents have been brought to maturity, and separated from the parent plant.

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* Anatomie Chirurgicale, 1833, vol. ii. p. 372.

† Nouvelles Démonstrations d'Accouchements, p. 62.

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* Professor Kölliker has described the fibres both of the unimpregnated and impregnated uterus. The latter he has described and figured as having nuclei, which I have never been able to verify although I have examined these fibres with the greatest possible care.

ART. VI. *Experiments on the Section of the Glosso-pharyngeal and Hypoglossal Nerves of the Frog, and observations of the alterations produced thereby in the Structure of their Primitive Fibres.* By AUGUSTUS WALLER, M.D. Communicated by Professor OWEN, F.R.S. Received November 22d, 1849. (From the Philosophical Transactions, Vol. 140, for 1850.)

THE object of the present observations is to describe certain alterations which take place in the elementary fibres of the nerve after they have been removed from their connection with the brain or spinal marrow.

The following is a brief summary of the opinions and researches of modern physiologists on alterations of the nerve-tubes.

Burdach[*] placed a ligature on the sciatic nerve of a frog, and after the lapse of a week found no alteration of the primitive fibres either above or below the ligature.

Steinruck[†] did the same, and states that in three cases the whole nerve was more slender than on the healthy side, and ascribed it to the atrophy of the neurolema.

Valentin[‡] denies likewise that there is any alteration of the primitive fibres in the lower portion of the nerve.

Gunther and Schön[§], whose researches are most interesting, state that the primitive fibres being examined towards the end of a week, after division of the nerve when it had lost its irritability, it was perceived that they had no longer the full round appearance of the sound ones. Here and there their contents appeared as if curdled; from eight to fourteen days after section these structural changes became still more evident, and continued to increase until the fibres appeared flat, broken up, entirely losing their transparency, their contents appearing as if disjointed.

Nasse[||] states, that five months after section of the sciatic nerve of a frog, the tubes below the section were broken up into granules and small clumps; that all the nerve-tubes were strongly granulated, in some the small granules being united into oval bodies, which appeared to be surrounded by a pale cylindrical membrane, which in some was wanting, owing probably to its disorganization.

Having in a former communication to the Royal Society described the nerves of the papillæ and of the muscular fibre in the frog's tongue in their normal condition, it is my intention at present to describe various alterations, as seen under the microscope, which take place in the structure of the same nerves after their continuity with the brain has been interrupted by section. The innervation of the frog's tongue is, as I have already shown, derived from two pairs of nerves, one arising from the brain, and traversing a foramen in the posterior part of the cranium, accompanied by the pneumogastric nerve. This pair corresponds to the glossopharyngeal in man. In its course it descends until it reaches the hyoglossus muscle, when it is accompanied by the lingual vessels passing over part of the hyoid bone, and entering the tongue without giving off any branch to the throat. The other pair arises from the anterior part of the spinal marrow, traverses the first cervical foramen, and constitutes the first cervical pair of nerves. Following the example of Burdach, I regard this pair as corresponding to the hypoglossal in man, and shall apply that term to it. It takes its course towards the tongue in a similar direction to that of the former pair, giving off several branches to the muscles of the neck and throat, and when it reaches the hyoglossus muscle it is considerably smaller than the glossopharyngeal. After attaining this muscle, it runs parallel to the former nerve, passing below the hyoid bone in its transit to the tongue. For a more minute description I must refer to the paper of E. Burdach, of which a translation has appeared in the Annales des Sciences Naturelles.

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[*] Beitrag zur Mikroskopischer Anatomie der Nerven, E. Burdach. Konigsberg, 1837, p. 42.

[†] De Nervorum Regeneratione. Berolini, 1838, p. 72.

[‡] De Functionibus Nervorum Cerebralium, &c. Lib. iv. 1839, p. 127.

[§] Müller's Archiv, 1840, Versuche und Bemerkungen über Regeneration der Nerven, p. 276.

[||] Ueber die Veränderungen der Nerven-fasern nach ihrer Durchschneidung, Müller, Arch. 1839, p. 409.

Division of the Glossopharyngeal Nerve.

That division of these nerves produces some serious lesion is proved by the death of the animal, which generally takes place a few days after the operation. Considering the well-known tenacity of life possessed by these animals, this was quite an unexpected result, for which I am unable at present to afford any satisfactory reason. We can only surmise, that besides their gustatory powers, they have others connected with respiration, in regulating the action of the tongue in closing the nares, for forcing the air into the lungs. Whatever may be the true explanation, it is impossible not to regard this result with surprise, when we consider the serious lesions which this animal is capable of undergoing at other points of the frame without loss of life. The usual time which it survives is variable, and depends greatly on the season of the year. If the examination takes place in summer, death frequently ensues on the fifth day; if in winter, not before the twentieth. For the purpose of avoiding this loss of life, I adopt the plan of dividing the glossopharyngeal on one side only of the tongue, and I find that it has the desired effect of preserving the life of the animal, while we can observe the same alterations on the corresponding side, as well as when both nerves are divided. Another advantage found in the division of a single nerve is, that on the uninjured side we have constantly at hand a means of comparison by which we can judge with certainty respecting any alterations that may be produced in the divided nerve. In cases of any doubt, it will always be found of the greatest service to examine at the same time a minute fragment from each side of the tongue.

The first effects of section of a glossopharyngeal nerve at the throat are decreased power of moving the tongue, diminished sensibility, generally very slight on the divided side, and symptoms indicative of some disturbance of the nutritive functions. The diminution of motor power is very slight, as is evident by the almost molecular tremor which still exists in any part irritated, and by the capability of retracting the tongue. The loss of sensation, which is also very slight, arises from the section of a few sensitive filaments which are contained in the glossopharyngeal nerve, and are distributed principally about the tubercular extremities. The lesions of nutrition and circulation on the side of the division are very variable and uncertain. Sometimes that half is œdematous, particularly towards the tubercle. Sometimes the papillæ are much injected and congested, while in other cases this side is more pale than the other. In many instances no difference can be detected between the two sides, until the organ has been slightly irritated, when on the divided side the vessels, and especially those of the fungiform papillæ, become congested and of a deeper red than on the other. Some of these differences probably arise from causes independent of the nervous lesion, as the vessels of the tongue which accompany these nerves are doubtless injured in some of the experiments.

During the first two or three days after section, no alteration in the texture and transparency of the tubes of the papillary nerves can be detected. Generally, at the end of the third and fourth day, we detect the first alteration by a slightly turbid or coagulated appearance of the medulla, which no longer appears completely to fill the tubular membrane, which does not appear to be affected. These alterations of the medulla are best seen in a fragment to which a little distilled water has been added to render it more transparent. When examined twenty-four hours after death, the difference between these and the nerves on the healthy side is still more evident. Commencing decomposition on the healthy side causes the nerve tubes to swell considerably, so as to attain nearly double their ordinary size. On the divided side the disorganized nerve retains nearly the same size and appearance as when fresh. Caustic potash, which dissolves all the tissues except the nerves, renders the altered nerves more transparent, and consequently the morphological changes are less apparent. Nevertheless, by comparative experiments made simultaneously, we may still detect a difference between the nerves of the two sides. In some cases, in about three or four days after section, I have traced the turbid state of the nerve from the fungiform papillæ into branches containing forty or fifty tubes, where it did not appear to terminate, but where the opacity of the nerve prevented my observing it any further. About five or six days after section, the alteration of the nerve-tubes in the papillæ has become much more distinct, by a kind of coagulation or curdling of the medulla into separate particles of various sizes. Sometimes the coagulated particles have an uneven spongy appearance, as if the component parts of the medulla, *i. e.* the white substance and the axis cylinder, were mixed together. Often they appear merely like separated particles of the medulla, such as are frequently effused from the ends of a divided nerve, and present the double contour and the central nucleus characteristic of the nervous medulla. In some cases the coagulated particles are very uniform in size and appearance, averaging $\frac{1}{7000}$th of an inch. In others, the limits between the maximum and minimum dimensions are far greater, namely, from $\frac{1}{2500}$th to $\frac{1}{12500}$th of an inch. The diameter of the altered tubes, examined in the ordinary manner in water, is about a fourth smaller than that of the sound ones, and in many instances the tubular cylinders appear wanting, and the medullary particles to have escaped from the cylinder, and to be merely held together by the neurilema which surrounds the whole nerve. After the application of potash, the diameter of the altered and unaltered nerves is as nearly as possible the same. This equalization of the two is produced almost entirely by a decrease in the size of the sound tubes, which swell considerably in water, and afterwards contract by the application of the alkali. It is therefore probable that the difference of size at this stage between the altered and unaltered nerves arises from the former not absorbing so much within them as the latter. Whether this arises from a ruptured state of the membrane or from a chemical change of the medulla, is not evident. After the surrounding tissues have been removed by potash, the tubular membrane offers no signs of rupture, and the medulla appears less disorganized than before the denudation. The disjointed condition of the medulla is greatest towards the extremities. A portion of each nerve-tube is frequently so disorganized as to be carried away among the tissues dissolved by the alkali. The circular rim so frequently presented by the extremity of the tubes is absent. We often observe around the healthy nervous branches, and the papillary nerve in particular, a common sheath or neurilema fitting closely to the nerve. After disorganization has attained this degree, it appears to form a kind of loose pouch around the nerve and separated from it by an interval of $\frac{1}{3000}$th of an inch. This pouch appears to form the sole investment of the curdled medullary particles, which, as we have stated, previous to the action of the alkali, appear void of any tubular investment. As we ascend towards the brain the disorganization appears to decrease, the coagulated medulla is more apt to assume the oval form, and at some places it presents its double contour apparently unaffected. The effect of decomposition in the unaltered and altered nerve is similar to that in the former stage. In consequence of the above changes the disorganized nerve is more opake than the unaltered one. In the tuburcles some of the ramifications of the tubes belonging to common sensation become disorganized after the section of the corresponding glossopharyngeals. These alterations take place in the same period and in the same manner as in the papillary nerves. With this exception, all the other nerves of the tongue, which comprise those of common sensation and of muscular action, remain unaltered. The muscular fibres of the papillæ are slightly altered at this period; their transverse striæ are not so distinct as on the healthy side, while their longitudinal ones are more so. The fibre itself is usually paler, narrower, and more wavy in its course.

The capillaries are either much congested with dark blood, or they are completely empty and scarcely to be detected.

The epithelium and the ciliary filaments are unaltered.

On the seventh, eighth, and ninth days the disorganization of the nervous structure continues to progress. In the papillæ the curdled particles of medulla become still more disconnected, and in parts are removed by absorption. The tubular sheath also is ruptured and disorganized near the extremities of the tubes. In the other ramifications of the glossopharnygeal, the medulla becomes more and more disjointed and collected into oval or circular coagulated masses.

On the tenth day and upwards we perceive another morphological state of the medulla. The coagulated particles lose their amorphous structure and assume a granulated texture. The granules, retained together by slight cohesion, are dark by transmitted light, but of a light white colour by reflection, and average $\frac{1}{20,000}$th of an inch.

About the twentieth day the medullary particles are completely reduced to a granular state. The condition of the papillary nerve is represented in plate 31, fig. 2, where we find the presence of the nervous element merely indicated by numerous black granules, generally arranged in a row like the beads of a necklace. In their arrangement it is easy to detect the wavy direction characteristic of the nerves. They are still contained in the tubular membrane, which is but very faintly distinguished, probably from the loss of the medulla and from atrophy of its tissue. The resistance of these granular bodies to chemical agents is most remarkable, for they remain unaffected by acids, alkalies, and the ethers, which have so great an influence over the nervous medulla. These granules may be detected within the papillary nerves for a considerable period of time. I have seen them apparently unaltered in the papillæ upwards of five months after division of the nerve, reunion not having taken place.

Division of the Hypoglossal Nerve.

When the hypoglossal nerves are divided at their exit from the spine, all movements of the throat and tongue are abolished, and the process of respiration entirely at an end. The tongue may be drawn from the mouth remaining completely inert, pinching or cutting causing no appearance of pain. Hence we may conclude that this nerve is of a mixed nature, containing sensorial as well as motor filaments. Another experiment, which shows this more plainly, consists in dividing one hypoglossal nerve near the spine on one side, and on the other the glossopharyngeal at its exit from the cranium. Pinching and other modes of irritation cause no pain on the side where the hypoglossal is divided, while on the other undoubted pain is caused.

After division of the hypoglossals at the throat, the motor and sensorial powers of the tongue are not entirely lost. When drawn out of the mouth, the extremity only remains fixed between the jaws, flaccid and powerless. At the inner half the fibres are still contractile, on account of their belonging to the hypoglossus, which at its lower half receives a branch from the hypoglossal nerve above the point of section. By this means, aided also by the mylohyoid muscle, which is left unaffected for the same reason, the inner half of the tongue still enjoys contractile powers.

Respiration is hurried and laboured, and death is the invariable result of division of these nerves, whether made at the spine or at the throat. In summer, the animals died at the end of two or three days.

Division of a single hypoglossal only causes paralysis of the corresponding half of the tongue, complete when the section is near the spine, and imperfect when at the throat. The animals generally survive after the section of one nerve.

The peripheric extremities of the hypoglossal nerves are most easily found at the inferior surface of the tongue. By removing a minute fragment at this region, we can observe, without any further preparation, ramifications of nerves, which are gradually reduced to a network of single tubules on the surface, among the capillary network. At the same time, among the muscular fibres are other ramifications, either crossing them in a transverse direction or running parallel. Like the former, they are reduced to single fibres, running in all directions without forming any free ends. It is at the under surface that the alterations of the hypoglossal must be studied.

During the four first days, after section of the hypoglossal nerve, no change is observed in its structure. On the fifth day the tubes appear more varicose than usual, and the medulla more irregular. About the tenth day the medulla forms disorganized, fusiform masses at intervals, and where the white substance of Schwann cannot be detected. These alterations, which are most evident in the single tubules, may be found also in the branches. After twelve or fifteen days many of the single tubules have ceased to be visible, their granular medulla having been removed by absorption. The branches contain masses of amorphous medulla.

We are naturally led to inquire whether extraneous circumstances have any influence over the removal of the tissue. We find that in the summer-time, when the renewal of the tissues must be considerably more active, in consequence of the increased respiration and activity of the animals experimented upon, that the alteration is more rapid than in winter, when they are in a state of torpor and hybernation.

At present we have restricted our observations to the alterations which take place in the ramifications originating from two trunks, but we cannot suppose that this is a local phenomenon, and that other nerves do not participate in similar alterations, and that the brain itself, composed in great part of tubular fibres, must be excluded. Experiments on other nerves already enable me to affirm that such is not the case, and that they are to be found on other nerves, such as the sciatic, &c., and, moreover, that they are as extensive as the nervous system itself.

It is impossible not to anticipate important results from the application of this inquiry to the different nerves of the animal system. But it is particularly with reference to nervous diseases that it will be most desirable to extend these researches. If one conviction impresses itself more firmly on the mind than another, it is that what we term functional diseases of the nerves are in reality owing to certain organic and physical changes in the tubular fibre, which it will be the province of the microscope to ascertain. If a few days' inactivity of a nervous trunk, such as is produced by ligature or section, is sufficient to cause such disorganization of the medulla, how can we refuse to admit of its being altered in cases of prolonged paralysis?

ART. VII.—*Observations on Healthy and Morbid Articular Tissues.* By JOHN BIRKETT, F.L.S. F.R.C.S., &c. Read before the Physical Society of Guy's Hospital, March 18, 1848. (From Guy's Hospital Reports, Second Series, Vol. vi., Part I, p. 36, October 1848.)

[THE present short paper by Mr Birkett it was our intention to have noticed in the article on the subject of Ankylosis in volume seventy-fifth, (p. 405); but the observations which it contains appear so important and instructive that they require to be noticed by themselves. They are, therefore, given nearly in the words of the author; and whatever seems necessary to be added in further illustration of the subject of ankylosis is subjoined afterwards.]

The growth and nutrition of the cartilage covering the articular extremities of bones has been the subject of many valuable and elaborate papers by observers in various countries; not to the extent, however, which the importance of the subject demands: for before studying the morbid changes taking place in the tissues of the body, I hold it to be essentially necessary that their normal and healthy condition should be as fully established as possible, not only in regard to their form and elementary composition, but also in relation to their stages of development or nutrition. The tendency of the pathology of the present day is, not to rest satisfied with the mere outward changes in the physical characters of organs, but, armed with more powerful instruments for observation, the pathologist engages himself with the examination of the changes and metamorphoses taking place in the materials effused as products of hyper-nutrition or of inflammation. Hence, it is necessary to obtain, as far as possible, some insight into the appearance and condition of a tissue when in a healthy state of nutrition, to trace the metamorphoses which the blastema undergoes to arrive at a perfect stage of development, and fully to comprehend the appearances presented by any tissue of the body in its perfect state of health.

As it is now an undisputed law that all tissues of the body, whatever their form or consistence, have undergone, step by step, fixed and definite changes from the moment when the peculiar blastema was effused as a fluid, and any deviation from which must be regarded as essentially detrimental to the perfection of the fabric; so it is required now, more than ever, to pursue with earnestness and patient observation the various phases of nutrition presented in a healthy state.

With this view I venture, not without fear of being regarded by some here present of stating facts with too great minuteness, and of describing appearances only visible to the assisted eye, to occupy the attention of the Society, by describing, as briefly as possible, the appearances presented by sections of articular cartilage, and to deduce from these observations such truths as may induce us to regard this structure as enjoying a more highly vitalized position (if I may use this term) among the tissues than at present is accorded to it.

I need not remind the members of this Society that the absence of vessels carrying the red globules of the blood is not any objection to the view here entertained of the constant and sustained, or even transitional nutrition of these structures.

The situation of this substance involves its constant exposure to pressure and attrition, and it must therefore become, after a time, in spite of the secretion formed for its lubrication, wasted and thinned, unless it enjoy either a most remarkable power of sustained nutrition, or, in the absence of this, a power of reproduction.

This reproductive function, I hope to prove, is enjoyed by the articular cartilages in common with other tissues, commonly designated by the terms non-vascular or extra-vascular, and which all belong to the extensive class Epithelia.

Now, there are so many forms of epithelia, that I must for one moment draw the attention of the Society to the following observations. They are all essentially nucleated globules originating in effused fluid blastema, but having arrived at this point, they then undergo definite metamorphoses.

1. They break up, discharging their contents under the form of secretions.
2. They become, either by absorption or desiccation of the surrounding matter, and by a process of flattening and cohesion, the laminated tissues; horns, hair, nails, epidermis.
3. They undergo transformations either in the walls of the globules, or the matter surrounding the nucleus increases and becomes changed into the basement or intercellular substance, or hyaline portion, as in cartilages.
4. There are the tesselated or protective epithelial tissues.
5. There is the pyramidal form, with or without cilia.

All these forms of epithelia pass through their matamorphoses with more or less rapidity in reference to the function they have to perform in the economy. The most rapid evolution occurs in the secretive; the more slow, in fact the slowest, in the cartilages.

It is scarcely necessary to describe minutely, although I must request the members of this Society to recall to mind, the changes which take place in the various layers of the epidermic cells; of the anatomy, in fact, of the corium and of the subcutaneous cellular tissue.

Analogues of these parts we find in the extremities of bones which enter into the composition of joints.

The subcutaneous cellular tissue is represented by the cancellous structure.

The corium and basement membrane is represented by a very peculiar and remarkably hard lamina between the cancelli and the cartilage; and

The epidermis has its representative in the cartilage layer.

Analogy may even be carried further; for we find marrow occupying the cancelli as fat does the areolar spaces of the subcutaneous cellular tissue, and the blood-vessels ramifying on the osseous lamellæ in the same manner as in the areolar laminæ, continuing even until they form reflected loops, just as occurs in the corium.

We might also regard the articular cartilage as a peculiar modification of that epithelium which invests the internal surface of the loose fibrous capsule; a modification to serve a particular end, namely, the prevention of concussions. There is no distinct continuation of the epithelium of the fibrous capsule upon the surface of the cartilage, so far as I have been able to discover, supported, as stated by some authors, upon a layer of fibrous tissue. But the appearance of epithelium is owing to a metamorphosed condition of the cartilage corpuscles, which, as they advance from their attached or osseous, or, I may say, early stage, to one more advanced or perfect—to their free surface, become flattened and arranged in a very definite manner.

This progressive arrangement it is which requires explanation.

If a thin section of articular cartilage be made with a sharp razor in a direction vertical to the articular surface of the bone, and including a portion even of the articular surface of the bone itself, the following appearances will be observed with a power of half-inch focal distance. The cartilage cavities near the bone will be found to have their long axis in various directions, some being placed vertically, some horizontally, and some obliquely, inclining either to the right or to the left, and this apparently unimportant diversity of direction is maintained to a considerable extent throughout the thickness of the cartilage. But as the free surface is approached, the direction of these cavities assumes a very definite and uniform course; no longer do we see an indiscriminate arrangement, but one which at once strikes the mind of the observer as determined and fixed. In fact we now meet with that portion of the cartilage layer which corresponds with the more external or outermost laminæ of the epidermis; a portion which has been pushed upward, as it were, by a continual but slow development of new cartilage tissue, which in its turn assumes the same regular arrangement, and is itself worn off or wastes by attrition in the movements of the limb, or in consequence of being disposed at so great a distance from the principal source of nutrition,—the vessels of the cancellous bone tissue.

Without some generative force of this kind, how can we explain those appearances regarded as cicatrices in cartilage? how the increase in superficial extent? how the thickness, which certainly varies in infancy, adolescence, and adult periods of life?

Fully corroborating the statements of authors, to the effect that articular cartilage never, in a normal condition, is penetrated by vessels carrying red blood, I cannot but claim for it that power of nutrition which is derived from the inherent and peculiar vital force enjoyed by the nucleated globule; a force as powerful in it as any with which the most highly vascular tissues are endowed: for were there time sufficient, I think I should be able satisfactorily to demonstrate that a high condition of vascularity is immediately connected with a more rapid, but not a necessarily higher degree, in kind, of development.

Independently of the peculiar power enjoyed by the lowermost nucleated globules, or rather those nearest to the bone, there yet exists another structure which probably possesses some peculiar endowment beyond mere solidity and hardness. This is the osseous lamina to which allusion has been made by authors, but with very great want of accuracy. It does not present the usual characteristics of bone at all. It is true that there exist in it, as in bone, lacunæ, and that these lacunæ are occupied by nuclei; but I do not find the beautiful arrangement of canaliculi leading from these lacunæ. The disposition of these spaces is very regular; and the substance of this tissue, which is extremely dense and hard, varies very considerably over the irregular surface of the true bone. It may be described in either of two ways: in the one, that this hard material is deposited between the projecting capillary vessels enclosed in their osseous canals, or that these osseous canals, with their vessels, extend into the hard tissue. However, whatever may be the function or mode of nutrition, or relation of this to the growth and development of articular cartilage, it always appears to exist; and in the present state of our knowledge it must, I believe, be admitted, as already stated, that the nutritious fluids pass through this thin lamina before reaching the cartilage.

The peculiar manner in which the capillary vessels pass from the cancellous tissue into tubes formed of true osseous tissue, although not new probably to the members of the Society, is well displayed in a preparation from which this drawing has been made. The looped form of capillaries has been described; but I am not acquainted with any description at all answering the appearances presented by the preparation from which the drawing was made. It will at once bring to mind the arrangement of the capillaries in the papillæ of the cutis, and the same function performed by them; namely, the part they play in the development of the epidermic scales may have its analogue in these capillaries of the articular extremities of the bones, and the generation and nutrition of the articular cartilage by means of them.

Briefly, in recapitulation, I would ascribe, then, to articular cartilage a higher degree of nutrition and development than is usually assigned to it, and arrange in three periodical series the appearances presented by it.

In the first, gradual increase in superficial extent and thickness; accommodating itself to the increase in the size of the articular extremities of the bones.

In the second, the power of sustained nutrition, or a something superior to this, by which the loss, necessarily arising in consequence of attrition and the constant disintegration and removal of tissue, is supplied, and new cartilage formed.

In the third, when all the powers of regeneration are diminished, and this tissue, as others of the body, becomes to a certain extent disorganized, softening, or even loss of this substance results,—atrophy of old age.

If this view of the nutrition of articular cartilage be admitted, I think it will more satisfactorily explain the connection between the diseases of the cancellous tissue of the articular extremities of bones and the destruction of the cartilage covering them, especially of that kind in which small perforations form in the centre of the articular fossæ or surfaces, and which are filled up as the disintegration, from loss of nutrition, proceeds by the vascular new formation.

It is now an established fact that there is no such morbid process as ulceration of cartilage, the process of ulceration being of such a nature that it cannot take place in a tissue organized in the manner of cartilage. The destruction of this tissue depends upon a loss of nutrition, a disintegration, in which the development of fat plays an important part.

Any mischief, then, which is sufficient to excite great action in the vessels supplying nutrition to the cartilage, and which nutrition in a normal state takes place by the effusion of blastema fitted to generate cartilage tissue, tends to interfere with or interrupt the healthy functions of the parts, and the results of inflammation are manifested in the separation of the cartilage from the bone (as the epidermis from the corium), and the effusion of a blastema in which is generated a fibre tissue, which at last receives within it capillary vessels, and which continues to increase so long as the destruction of the cartilage proceeds, and there is space formed for it to insinuate itself between the bones or cartilages, as circumstances may arise.

These vascular new formations, when attached either to the synovial membrane of the capsule, or arising from the osseous surfaces, have their origin in the effusion of blastema, and are closely connected with the normal vascular arrangement of the parts from which they grow. It is, I believe, necessary that even the thin and delicate lamina immediately beneath the cartilage be destroyed before they can be developed from bone, for then they are closely in contact with the vessels of the cancellous tissue.

The term *ankylosis* does not at all indicate the condition of the parts which once constituted the moveable joint. Modern surgery, in fact, should repudiate the term, as it implies a condition of the limb which it is to be hoped does not often now occur. Derived from the Greek, it signifies a bending or curvature of the joint—a condition likely enough to occur in cases if neglected. But a word used by Professor Rokitansky, *synostosis* (συν & ὀστέον), most fully indicates that condition of the articular extremities of two bones by which they become immoveably connected together by the blending of the cancellated tissue, and a total destruction of the articular lamellæ.

This state is seen in some cases; but, even when very far advanced, spaces may be found where portions of the articular lamellæ are remaining, and in which points no bony junction has taken place.

Imperfect ankylosis, as it is termed, results in a great degree, I believe, from the persistence of this delicate articular lamella, the continuance of which prevents the complete amalgamation, as it were, of the cancella of the two bones, but allows of the effusion and vascularization of a fibrous tissue, in which earthy matter is not deposited in consequence of the articular lamella interposed between it and the capillaries carrying nutritious fluids to the bone, and from which the earthy matters are deposited.

I do not allude to stiff joint depending upon the condition of the parts surrounding the joints—the tendons, fasciæ, &c., from a desire to confine the observations to the ends of the bones themselves.

In conclusion, I hope that the desire to condense this communication as much as possible, and the endeavour to avoid all unnecessary detail with which only those may be conversant who will condescend to extend their powers of observation by mechanical appliances, have not thrown obscurity over the remarks. I subjoin, however, the following recapitulation.

That articular cartilage enjoys a power of slow but continual growth; and that as the layers upon the free surface become destroyed their place is supplied by the generation of a new tissue from the articular ends of the bones.

That this nutrition of cartilage is sustained by the peculiar arrangement of the vessels in the bone immediately beneath the articular laminæ, somewhat in the same manner as the epidermic scales are generated upon the vascular loops of the corium.

That the destruction of the articular cartilage depends chiefly upon a diseased state of these capillary vessels, whereby its nutrition is suspended, and that then disintegration, simply, and not ulceration, takes place.

That this disintegration is mainly attributable to a metamorphosis or conversion, first of the nuclei, and then of the intercellular or hyaline substance, into fat.

That as the disintegration of the cartilage tissue advances, a fibre tissue, in which capillary vessels become developed, supplies the loss, and increases in consequence of the nutrition supplied by the neighbouring vessels.

That after the destruction of the cartilage, the thin, delicate, and peculiar lamella of the articular extremities of bones must be destroyed before synostosis, or perfect osseous union, can result.

Examination of a Knee-joint, amputated by Mr Cock, February 22, 1848.

The joint examined was the left knee.

The outlines of the bones forming the articulation were lost in consequence of the swelling of the surrounding tissues. A sinus opened upon the outer side of the joint and communicated with the cavity. The joint was laid open by reflecting the patella and attached soft parts. The latter were infiltrated with plastic effusion. The ligaments, internal and external lateral, were firm and apparently healthy in texture, likewise also were the crucial, but they were covered with the peculiar flocculent matter thrown out into the joint. The sinus was lined with a very vascular, soft, and flocculent growth. A few traces of apparently healthy synovial membrane were seen upon the anterior portion of the capsule. The patella was imbedded in soft, vascular, and flocculent tissue, and could scarcely, from this condition, be detected: all its cartilage had disappeared.

The head of the tibia was entirely deprived of articular cartilage—not a trace was discoverable; and the interarticular fibro-cartilages were also entirely destroyed. Upon the external tibial fossa a portion of necrosed and moveable bone was felt and seen, with a very polished surface about the size of a fourpenny piece, its edges very irregular and worm-eaten, and with the vascular fringes surrounding it, just as they surround or encroach upon cartilage in a state of fatty degeneration. This piece of bone exhibited the thin layer of compact tissue of the articular fossa, and around it only the cancellous tissue of the bone was seen. This description suffices for the internal fossa, except that here no loose necrosed portion of bone existed, a portion of compact shell alone being surrounded with the vascular fringes. Under the external fossa there appeared to be, upon dissection, within the bone a mass of scrophulous deposit. The bone was soft and very fatty.

The condyles of the femur were very nearly deprived of the whole articular cartilage which had once covered them, and vascular fibrous tissue occupied its place, of more or less thickness. The outer side of the external condyle was in a state of at least commencing necrosis, and surrounded and overlapped by the red flocculent fibrous tissue.

This most interesting case exhibits several processes adopted by nature in the reparation of diseased joints, for synostosis must be considered as the reparative action of nature.

1. The destruction of the cartilage.
2. The development of vascular fibre tissue.
3. The destruction also of the compact articular lamina.
4. A development of fibre tissue.
5. The deposit of earthy matter in this, almost cartilaginous, fibre tissue.

From the foregoing observations it results that Mr Birkett differs from many of those practical authors who have written on this subject, and agrees in some respects with Mr Mayo and all those who disapprove of the present vague use of the term *ankylosis*. Mr Birkett, indeed, admits only one kind of ankylosis; namely, that which takes place in disease and destruction of the cartilages sufficient to expose the denuded articular ends of the bones, and form a new union without the medium of cartilage. This corresponds with the bony ankylosis of Mr South, and even with *soft ankylosis*, as defined by Mr South, and the three forms described by Mr Mayo. Mr Birkett further rejects entirely the form of the infirmity called False, Spurious, and Incomplete Ankylosis. False ankylosis, indeed, is, as we have already said no ankylosis at all. It is a condition of the joint in which immobility is most commonly the effect of some form, stage, or degree of inflammation, and which accordingly goes off, in proportion as the inflammatory state is subdued and subsides. This inflammation may affect, 1*st*, the aponeurosis or fascia outside the joint, and passing from the one bone to the other; 2*d*, the capsule or general covering; 3*d*, the lateral ligaments of such joints as the knee-joint and the elbow-joint, or the wrist; 4*th*, the inter-articular ligaments; 5*th*, the synovial lining; and, 7*th*, the cartilages; or two or more of these textures altogether.

The affection varies according to the nature of the inflammation. In what is called disease of the joints, it is in general the synovial membrane that is first affected, and then the cartilages; and, as in the case of the first being inflamed, lymph is effused within the joint, the union of the two articulating ends is of a more general nature, and obstructs more the free motions of the joint than when either the fascia or the capsule is affected.

The ligaments are not very often inflamed, unless in consequence of injury, or after inflammation of the synovial membrane, which lines one side of them. When synovitis is extensive, either spontaneously, or in consequence of injury, the inflammation always almost extends to the ligaments, and renders them thick, soft, and brittle, so that often they are altogether destroyed. This is often observed in disease of the hip-joint, in the circumstance of the round ligament being destroyed and disappearing altogether. It does so in consequence of inflammation. Neither can these ligaments be said to be destroyed by suppuration. The process is rather a species of disintegration. They first become soft, thick, flaccid, and brittle; then their fibres are separated and broken asunder; eventually they crack and are absorbed. The action, or rather non-action, is a species of atrophy dependent on previous inflammation.

The capsule is inflamed not only in disease of the joints, but in rheumatism and gout. But the inflammation is rather secondary in the case of disease of the joints; while it may be primary in that of gout or rheumatism; that is to say, the capsule is the part originally affected, and thence the inflammation extends to the synovial membrane, and sometimes to the periosteal and perichondrial coverings. This action produces not only thickening of the capsule, and rigidity and immobility of the joint, but effusion of sero-albuminous fluid within the joint, sometimes effusion of sero-albuminous fluid into the pericapsular cellular tissue.

This is manifestly a form not unfrequent of what foreign authors vaguely call false, spurious, and imperfect ankylosis.

The stiffness and immobility of the joint is the effect of the inflamed and thickened state of the capsule and of the other morbid secretions; and providing this inflammation is subdued in sufficient time, to prevent serious injury from being inflicted on the synovial membrane, and causing the agglutination of its contiguous surfaces, the stiffness and immobility may be diminished, and finally removed; and the ankylosis is then said to be cured. It is, notwithstanding, clear that this condition is not genuine ankylosis; and the facts communicated and the distinctions established by Mr Mayo, Mr South, and Mr Birkett, ought to be sufficient to show that the name ought not to be applied in this manner.

There is yet another condition of certain textures connected with joints, which, either associated with the last mentioned, namely, the morbid thickening of the capsule, or some of those previously noticed, or occasionally alone, may give rise to the state denominated false and incomplete ankylosis. This is thickening, induration, and contraction of the fascia, in consequence of chronic congestion and inflammation. This condition most commonly affects the popliteal fascia in the case of the knee-joint and the bicipital fascia in the case of the elbow-joint. This thickening, induration, and contraction of the fascia may occur as an effect of capsular and synovial inflammation, either separately or conjointly, and as such is seen after strumous inflammation of the knee and elbow-joint. But it also takes place in rheumatism, in gout, and in rheumatic gout, and indeed more or less of it is seen in almost every form of these disorders. Its tendency is to induce a slight but permanently bent state of the joint, so that it cannot be extended without pain, and without more or less injury to the fascia, and sometimes to other parts, if the inflected state of the joint have been of long standing, or is considerable in degree. In general this may be recognized by the peculiar appearance of the joint, the impaired and limited degree of mobility, and by the circumstances attending the origin and progress of the disorder. The figure and consistence of the swelling should also be attended to, as it is often possible to recognize, upon careful examination, thickening of the capsule and fascia, with that sort of puffy enlargement which denotes the presence of fluid within the cavity of the joint.

The cause of this peculiar inflection and incapability of extension seems to be manifold. Unquestionably the affection of the capsule and the synovial membrane contribute much to it. But independent of this, the irritation within the joint causes indirectly the flexor muscles to contract, in order, apparently, to diminish somewhat the painful sensation arising from the extended state of the joint. Whether this be the fact or not, it is a fact that, in the majority of cases of articular and intra-articular inflammation, the flexor muscles act in a constant and steady manner in inducing and maintaining the limb in the inflected condition; and in this condition it is always less painful than in the extended state. It is possible that this condition may also be influenced by the inflammatory and hyperemic orgasm being more intense in the extensor aspect of the joint than in its flexor aspect.

This, however, is not the sole cause of stiffness and immobility. A very considerable amount of these phenomena is certainly dependent upon the thickening, induration, and contraction of the fascia. Mr Wickham speaks of contraction of the muscles; and others, especially Dr Little, have attached great importance to contraction of the tendons. It is possible that the tendons may be contracted, and in some instances they are so. But by far the most general lesion in this form of stiff-joint is the thickening and contraction of the periarthral fascia.

The affection may even proceed from the fascia to the periosteum connected with the articular ends of the bones.

This lesion is most common as a consequence of rheumatism, and what is called rheumatic gout. That affection is seated originally in the fascia, and thence proceeds to affect the capsular and the synovial membrane, and other parts of the articular apparatus. After some time it gives rise to an irregular deposit of earthy, or animal and earthy matter, over the extremities of the bones; and this deposit also tends to limit and impair the mobility of the joints. This deposit it is of which Mr Corfe speaks, as in rheumatism, causing locking of the joints. Without adopting his idea as to the original cause of this, which may be found in his book, Mr Corfe is quite right as to the fact that the joints are as it were locked or limited in motion in consequence of the disease.

These considerations will, we trust, tend to afford some explanation of what is really meant by false and incomplete ankylosis, and of the modes in which that infirmity is occasionally cured, or seems to be cured, and disappears. Even in the last-mentioned form, where the limited motion depends on the state of the fascia, much may be done to restore the joint. Under favourable circumstances, such joints recover their mobility under various methods, and sometimes methods apparently opposite. It has been seen that M. Fleury cures joints in this state by the systematic application of cold water. M. Gros, on the other hand, employs iodine embrocations. In some instances, cases of this kind derive benefit from the use of Buxton waters; in other instances, from those of Bath; and certain cases, which derive benefit from neither, are improved under the use of the waters of Aix-La-Chapelle.

The advocates of the cold water method of treatment say, that local means and applications are of little avail unless the general health is amended; and hence, that all local treatment may be neglected provided attention is given to improve the functions of the skin and the digestive organs by the copious use of cold water internally and externally. It is impossible to deny that the substitution of cold water for the several stimulating and hurtful drinks in common use, must be beneficial; and the employment of cold water externally may also be advantageous if administered under the eye of an intelligent physician, who sees that there is no chance of inducing by this agent such internal disorders as *pericarditis* or *endocarditis*, or *meningitis* or pneumonia. Unless, however, this precaution is taken, such a remedy indiscriminately employed is very likely to do harm.

Of local remedies there are multitudes; but all are uncertain. Those which operate by abating inflammation and inducing counter-irritation are the most useful; and of the latter, the actual cautery or the potential caustic is by far the most efficient.

ART. VIII.—*Report on the Fevers of New Orleans—particularly the Yellow Fever of* 1849. By E. D. FENNER, M. D., of New Orleans, &c. &c. (Southern Medical Reports, &c. Vol. i. p. 109. 1849.)

IN New Orleans we have met with all the forms of endemic fever which were familiar to us in the country (West Tennessee, Mississippi and Madison Parish, La), with the addition of yellow fever and ship fever or genuine typhus. We have found those common to the city and country to prevail at the same season and in a similar manner, excepting that we met with a more rapid and malignant congestive fever in the country than in the city, and the bilious remittents of the country retain their character throughout, more than they do in the city. Here, in the summer and autumn, they have a decided tendency to *crisis* by *hemorrhage*. This makes *yellow fever*;—it forms the true characteristic difference between the high degrees of summer and autumnal fever in the city and country, and must depend on locality and attendant circumstances. We have intermittent, remittent, and continued fevers, alternating in type, and running into each other, just as they do in the country. Intermittent fever prevails here throughout the year as it does in the country. During the healthiest years it predominates over all other types; but during the sicklier years, in the country, it runs into remittent, bilious and congestive, whilst in the city it runs into yellow fever.

Dr Harrison testifies that he had often observed malignant intermittents immediately to precede the outbreaks of yellow fever epidemics.

The New Orleans Charity Hospital is probably the most extensive fever hospital in the world. Let us see how far the statistics of disease at that institution will sustain our observations. It appears from the records, that in a period of nine years, from the 1st January 1841 to 1st January 1850, there were admitted into this hospital 73,216 patients; of which number there were admitted for all the different forms of fever, 33,381 (and among these last), for intermittent fevers, 17,217.

It would thus appear that nearly one-half of all the patients admitted into this hospital were for the different forms or types of fever—and that more than half of these were intermittents.

It should be mentioned that this vast number of patients includes a lunatic asylum, having from sixty to ninety inmates, up to June 1848, when it was removed to Jackson; that the large number of fever patients includes many that were imported by sea, and brought from the neighbouring countries; and that the intermittents include the different species known as simple malignant, pernicious and congestive. If we take into consideration that the intermittents are mostly our own, *i. e.* they originate in the city and surrounding country, whilst the continued fevers are mostly imported, the preponderance of the former will be still more striking. Let it not be forgotten, too, that during the time specified there was but one single year (1845) in which our city was exempt from yellow fever.

The following statement will show the prevalence of intermittent fevers at the different seasons of the year for the time specified:—

Int. Fever.	Spring.	Summer.	Autumn.	Winter.	All Fevers.	Yellow Fever.
1841	112	403	177	92	1991	severe.
1842	114	453	394	135	1758	little.
1843	85	208	413	137	2222	severe.
1844	117	469	732	231	2207	little.
1845	180	353	664	206	1763	none.
1846	236	569	1045	218	2603	little.
1847	391	508	691	602	6901	severe.
1848	282	689	874	535	6361	moderate
1849	420	1701	3738	1275	7575	do.
Total,	2443	5353	7728	2331	3381	

It will thus appear that intermittent fever prevails here all the year round; gradually increasing from the winter up to the autumn, when it begins to decline. It will be seen, however, that there is considerable variation in the amount, as well in the different seasons as in different years. The proportion is greater in the healthy years; but intermittents are never entirely absent, even when yellow fever is raging. During the nine years specified, on selecting the month in which yellow fever was worst, we found the following relative proportion of intermittent fever at the Charity Hospital:—

1841,	September—Yellow Fever		682	Intermittent	18
1842,	...	...	247	...	144
1843,	...	...	365	...	128
1844,	...	...	68	...	255
1845,	...	...	0	...	279
1846,	October,	...	83	...	376
1847,	August,	...	1611	...	74
1848,	September,	...	597	...	299
1849,	October,	...	520	...	720
			4133		2293

At the very same time we also find more or fewer cases marked remittent and bilious fever. Cases are seen every sickly year, commencing as intermittent or mild remittent, and wanting those strongly-marked diagnostic symptoms which have been said to distinguish yellow fever; yet which, if neglected or maltreated, terminate in hemorrhage and black vomit. In these cases the advocates of the specific character of yellow fever contend that the patients contract a new and different disease; but we think improperly. We believe it is all the same disease, differing only in degree and stage. The attack was of its mildest form, and if promptly and properly treated, it could have readily been cured in that form, just as it is done in the country; but if neglected or maltreated, it runs into the hemorrhagic stage.

This brings us to the consideration of the distinguishing feature of the summer and autumnal fevers of this locality. vast majority of cases in their mild forms, and the early stages of the more intense, are exactly such as are seen all over t southern country. The more malignant forms, and the advanced stages of the mild, have a decided tendency to terminate hemorrhage. This constitutes what is called yellow fever, and the main feature that distinguishes it from the endemic fever of the country. Physicians may say what they please about being able to distinguish a case of yellow fever as soon as they examine it: we do not believe it possible, according to their ideas. Rarely does a summer pass, in which we do not hear of some intelligent and experienced practitioner being perfectly astonished at seeing what he had pronounced a case of intermittent or remittent bilious fever terminate in black vomit or other hemorrhage. Now what causes this tendency to hemorrhage in the summer and autumnal fevers of New Orleans, and occasionally in other southern localities, we do not pretend to say, for we do not know. But that it depends on something connected with the locality is beyond a doubt.

Seeing, then, that all the forms of idiopathic fever met with at this locality prevail together, and are frequently seen to interchange, and run into each other, we are led irresistibly to the conclusion that they are merely modifications of disease springing from one and essentially the same general remote cause. All authors agree that the intermittent and remittent bilious fevers of the country, in the summer and early autumn, spring from the same remote cause, and consequently are but varieties and grades of the same disease. Now we contend that the yellow fever of New Orleans holds the same relation to its intermittents that the severe bilious fever of the country does to the intermittents there;—they are therefore in the same category. We do not agree, with Rush and others, that yellow fever is nothing but a high degree of bilious fever; for we admit that the latter is sometimes the most malignant of the two, without displaying the characteristic features of the former. Our position is, that yellow fever is only one of the forms of endemic fever (malarious, if you will), which derives its characteristic features from the locality and attendant circumstances where it prevails. Admitting that all these fevers proceed from remote causes closely allied in their essential nature, though not precisely identical, and that the milder forms and the early stages of the more intense forms are very much alike, we are still presented with the remarkable difference in their mode of fatal termination. The fevers of the country cause death by inflammation of the brain or of the gastro-intestinal canal, or by that strange lesion of the nervous system which is called congestion;—the fevers of the city produce such an alteration of the blood and the solids as leads to fatal hemorrhage and jaundice.

We might go still farther, and say that the very same remedies which have been found so beneficial in the fevers of the country, are equally applicable to the fevers of the city, though they require to be differently administered. We have found them so; but as there exists much difference of opinion on this point, we will reserve it for more extended experience.

We do not believe that yellow fever can properly be classed amongst epidemics, if there be any strict and real distinction in the meaning of the terms epidemic and endemic. Epidemical diseases, such as measles, scarlatina, pertussis, influenza, and cholera, may prevail in any region or climate; but endemical diseases are confined to the localities where they habitually prevail, and depend upon circumscribed influences. Under this view of the subject, yellow fever is just as much an endemic disease in New Orleans and other places where it prevails, as remittent bilious fever is in the country. We have no other objection to the common acceptation to the term epidemic, as applied to express the extent to which any disease may prevail, than that it may be giving too much latitude to the definition of our nomenclature. In our allusion to yellow fever, we shall continue to use the term as it is commonly understood.

After seeing the statistical facts which have been presented, writers should not dwell too strenuously upon the distinction that yellow fever is a disease of cities and towns, whilst intermittent and remittent bilious fevers belong to the country. We have demonstrated the fact, that in New Orleans, one of the favourite abodes of yellow fever, we have all the forms of summer and autumnal fever met with anywhere;—and yellow fever has been seen in very small villages, sometimes even in the country.

The forms of summer and autumnal fever common in the country are met with in all our southern cities, from Vicksburg round to Norfolk. These places likewise, at intervals, have epidemics of yellow fever. Nor does yellow fever confine itself to these ports of entry. It sometimes prevails at small towns in the interior of the country, and remote from navigation. Time was when these southern cities, New Orleans, Natchez, Mobile, Augusta, Savannah, Charleston, Norfolk, and others, with a goodly population too, were strangers to yellow fever: they were subject alone to the ordinary endemic forms of the country. But in the course of events this new type made its appearance in an unaccountable manner. Why did not yellow fever prevail at Mobile and Natchez previous to 1817, at Vicksburg before 1841, and at Rodney before 1843? We know not, for we are ignorant of its cause; but there stand the facts, and we must account for them in the best way we can. Something must take place in these localities to produce occasionally this modification of endemic fever. Whatever be the essential nature of the remote cause of fever, it must be subject to modifications. Like causes produce like effects; but it is notorious that the prevailing fevers of successive seasons vary considerably at the same place. These variations, therefore, must be attributable to modifications of the cause; which is certainly a more rational supposition than to attribute the various types of concomitant fever to the simultaneous action of separate, distinct, and specific causes.

But we will pursue the subject no further at present. Our object has only been to present some of the facts and the results of our own observation. The conclusions are our own, and have been arrived at after patient and deliberate investigation. They coincide with many of the best writers on yellow fever, and we are happy to know they are entertained by some of the most intelligent and experienced physicians of this city.

Having published in the 3d, 4th, and 5th volumes of the New Orleans Medical and Surgical Journal full accounts of the yellow fever which prevailed here in 1846, 1847, and 1848, we shall now proceed to give a brief report on the disease in 1849.

The Yellow Fever of 1849.

After the decline of cholera in June, the endemic fevers of this locality rose in the ascendant, and prevailed to but a moderate extent, and we think in the mildest form of their different types ever seen. Seldom have the physicians of the city had less to do during the summer and autumn than in 1849. This is more particularly set forth in the monthly journal of our General Report. Yellow fever attracted but little attention, and was never spoken of as an epidemic; yet it will be seen that 769 deaths from it were reported to the Board of Health.

The admissions for fever into the Charity Hospital were quite numerous, and the mortality from yellow fever considerable. A great majority of the deaths from fever in the city occurred at this institution. The ratio of deaths to the number of yellow fever cases admitted into this hospital was about as great as usual; which would appear to contradict our remark as to the mildness of the prevalent disease; but, as paradoxical as it may appear, we think this great mortality may correctly be attributed to the mildness of the disease. It is notorious that the class of people who go to the Charity Hospital for yellow fever is composed chiefly of robust labourers and mechanics, who generally defer applying for admission as long as their sufferings are endurable,—often too late for successful treatment. This is the principal cause of the greater mortality at this hospital than in private practice every year. These people have no idea of prudence or discretion, and are ignorant of the vast importance of early treatment both in yellow fever and cholera. They keep about their business as long as they can, or stay at home and do nothing until they become dangerously ill, before applying for medical aid. If a violent disease, with urgent and distressing symptoms, be prevailing, they are driven in earlier; but if a disease equally dangerous, though mild and insidious in its attack, be prevailing, they still wait to become really ill before calling for relief. Now it is admitted that yellow fever may assume either of these types, and yet certainly lead to death, if not promptly and judiciously treated. It matters not whether the fatal stage has been arrived at by the mild or the violent type; it is then the same thing, and they will all likewise perish with black vomit or other hemorrhages. During this season nothing was more common than to see patients admitted from the third to the sixth or the seventh day of fever. There was then no difficulty in the diagnosis, and these were pronounced yellow fever. In fact many of them were but little better off than if they were in the collapse of cholera. Cases not so far advanced, or of milder type, were promptly relieved, and discharged under a different name. The table we shall presently insert will show an unusual number of other fevers admitted during the prevalence of yellow fever.

The cases of fever seen in private practice were of the same character,—most of them so mild, and so easily cured, as not to be called yellow fever; but those that terminated fatally generally presented the characteristic features in the end. If death, or a near approach to it, be required to enable us to make a diagnosis, we can never expect to get much credit for our skill in treating yellow fever. But the fact is, there prevails much error upon this point. During the yellow fever season in New Orleans, any attack of fever, be it intermittent, remittent, or what not, in an unacclimated person, if neglected or maltreated, is liable to terminate in hemorrhage and yellowness of the skin, and then no one will hesitate to call it yellow fever. If properly treated and promptly relieved, it is called intermittent or remittent bilious fever.

The following table will show the relative proportion of the different types of fever admitted into the New Orleans Charity Hospital during each month of the year 1849:—

Fevers.	Jan.	Feb.	Mar	April.	May.	June.	July	Aug	Sept.	Oct.	Nov.	Dec.	Monthly Totals.
Intermittent	109	114	138	117	69	155	368	592	763	720	360	684	4439
Typhus		127	193	140	128	65	43	44	49	21	23	58	891
Typhoid	79												79
Remittent	5	10	13	14	30	49	72	166	223	116	76	50	824
Bilious	6	6	19	9	6	10	39	20	11	3	1		130
Yellow							2	28	374	520	130	6	1060
Ephemeral	4	8	18	18	6	2	7	8	7	1	2	1	82
Congestive					1	4	2	6	8	8	4	6	39
Pulperal						1		2		1			4
Scarlet											1		1
Bilious	6	6	19	9	6	10	39	20	11	3	1		130
Cerebral	1				1				1				3
Continued	1					6	6	1	2	2	1	1	20
Total.	205	265	381	298	241	293	540	869	1418	1392	806	806	7575

Here we may note the great preponderance of intermittents over all the others put together, and over any other type at all times; also the prevalence of various types of fever at the same time; besides other points which we need not mention. These statistics certainly substantiate the views we have set forth.

The yellow fever of this year commenced about the last of July, when, as will appear above, those marked remittent and bilious were quite rife. The following table will show how the first cases of yellow fever appeared at the Charity Hospital. Some were seen in private practice fully as early.

A table showing the date of admission, length of residence in New Orleans, the time sick when admitted, date of discharge, and the result of the first fifteen cases of yellow fever at the Charity Hospital in the year 1849:—

Date of Admission.	Residence in New Orleans.	Sick when admitted.	Date of Discharge.	Result.
1st Case July 28th	3 months	1 day	July 30th	Died
2d " August 1st	9 years	unknown	" 11th	Recovered
3d " August 5th	2 years	5 days	July 6th	Died
4th " August 6th	7 months	7 days	October 24	Recovered
5th " " 6th	3 days	2 days	August 9th	Recovered
6th " " 6th	2 years	5 days	August 9th	Died
7th " " 11th	1 month	unknown	" 12th	Died
8th " " 12th	1 year	2 days	" 23d	Recovered
9th " " 18th	7 months	4 days	" 22d	Recovered
10th " " 18th	5 months	2 days	" 20th	Died
11th " " 22d	3 months	unknown	" 22d	Died
12th " " 22d	18 years	"	October 16th	Recovered
13th " " 24th	3 years	3 days	August 25th	Died
14th " " 24th	4 months	1 day	September 1st	Died
15th " " 24th	4 months	4 days	August 28th	Died

There were thirteen more cases admitted during this month; but these are sufficient to show how the disease commenced. From this time the number of cases steadily increased until October, after which month it rapidly declined.

The annual report of the Charity Hospital will show the relative number of admissions, discharges and deaths, from the different fevers, during the year.

We were in attendance at the Charity Hospital during the months of September, October and November, and saw cases of intermittent, mild remittent and dysentery, run into well-marked yellow fever. Dr Brickell informs us that he had a case in his ward, which entered as an intermittent, and was relieved; but before leaving the hospital a relapse occurred which proved to be decided yellow fever. This was also relieved, but before convalescence was established the patient fell into distinct intermittent fever again. An experienced medical friend told us of a case of intermittent fever in private practice, which most unexpectedly terminated fatally with black vomit. Late in the season the fevers were slow in their progress, in many cases not coming to a crisis till the 9th, 11th, or 13th day, as occurred in 1846.

We saw no fatal case in private practice. Those which we saw early in the attack we found no difficulty in relieving promptly—a few which were far advanced when we were called, made narrow escapes.

We shall now offer some of our views on the pathology and treatment of yellow fever. They are somewhat novel on both points, but we believe them correct or we would not publish them. They are necessarily brief and imperfect, but will be enlarged at a future time, when we will candidly report the results of further experience.

Treatment.—The various plans of treatment approved by the different physicians of the city were pursued this year, and we presume with satisfactory results. We will not undertake to describe them. As for ourself, in furtherance of the views set forth in our accounts of the epidemics of 1847 and 1848, we trusted fully to what we have termed the "abortive method by quinine," and with results entirely satisfactory. When called to a case within twenty-four or thirty-six hours of the attack, we seldom failed to cut short the fever by large doses of the sulphate of quinine in combination with opium or morphia, frequently followed by a little blue mass or calomel. Our usual mode of proceeding in this stage is, to order at first a hot mustard footbath and a purgative enema—then give to an adult 20 or thirty grains of quinine with 25 or 30 drops of laudanum, or one or two grains of opium, or the fourth of a grain of sulphate morphiæ, at one dose. This would generally reduce the vascular and nervous excitement completely in the course of a few hours, throw the patient into a profuse perspiration, relieve all pain and produce sleep. The bowels were kept open by some gentle means, and more or less quinine was repeated as occasion required. We recollected but one fever patient that required cupping, and we did not have a single one bled from the arm.

In the early stage of yellow fever the derangement of the system is entirely functional, and consists chiefly in lesion of innervation. In the advanced stages it is altogether a different affair—organic lesions have then taken place, and the blood is altered. As soon as the attack is fully developed, the indications are, to reduce nervous and vascular excitement, relieve pain, and keep the principal emunctories (skin, liver, kidneys, &c.) in steady and free action; thus arresting diseased action in the incipient stage. Experience has proven that all this can be done by the remedies just mentioned, if resorted to early enough. In the advanced stages you have a different state of things—you have to contend with engorgement of the gastro-intestinal mucous membrane and of the liver, spleen, kidneys and brain, a sluggish circulation of altered blood, and an arrest of all the most important secretions. The nervous centres, which first suffered and complained, now become calm and composed; the intellect generally retains its natural clearness, and the patient is often lulled into an illusive sense of safety, whilst the experienced physician knows that irreparable injury has been already done. In these latter stages, the physicians should abstain from attempting to do too much. The main reliance must be upon the energies of the constitution, which are to be aided and fostered with the utmost circumspection. The indications are, to husband carefully the remaining strength, to keep the circulation and excitement as well equalized as possible, to restore the suspended secretions, and to keep up the process of nutrition. To fulfil these we endeavour to enforce the most perfect quietude, and resort to blisters, warm sponging, fomentations, carminative antacid mixtures, gentle stimulants and mild nourishment.

We would by no means be understood as intending to denounce or proscribe sanguineous depletion in the treatment of yellow fever. On the contrary, in violent attacks upon persons of plethoric habit, we look upon it as of great value and importance. Free depletion is applicable to the same stage that quinine in large doses is, and is a valuable adjuvant to that remedy. We merely wish to state, that since 1847 we have learned from actual observations, that liberal doses of quinine and opium, given early in the disease, and during the exacerbation, will subdue the fever and permanently and safely cut it short of its natural course, in a great many cases, without resorting to blood-letting in any manner. We know that this is incredible to those who have not witnessed it;—we could not believe it ourself till we had seen it done over and over again. If what we state be true, however, should it not be made known generally? Is it not desirable to avoid, if possible, all the pain, exhaustion and anxiety, (not to say danger), necessarily incurred whilst slowly and cautiously conducting a case of yellow fever through all its natural stages? Is it not an object of vast importance to cure the disease "*cito tute et jucunde?*" If we are labouring under false impressions and have not viewed aright the phenomena which have fallen under our observation, we trust we shall become convinced of the error. We have witnessed the various plans of treatment ordinarily pursued in this city, and we know that our experienced and skilful physicians do manage all sorts of cases with commendable success by their own methods, when they have a fair opportunity. Every one has some favourite general plan, and we only claim the same privilege, after having tried most of the others. If we did not think our own plan the best we would not follow it. We may endeavour to demonstrate its superiority without condemning or denouncing that pursued by others. That large doses of quinine and opium, given improperly, may do much mischief, is unquestionably true; but the same may be said of Epsom salts, calcined magnesia, or any thing else that possesses any power whatever. Nothing is more true than that any medicine which has great power to do good, is likewise endowed with corresponding capacity to do harm, if misapplied.

In presenting these views relative to the therapeutic action of the sulphate of quinine, as yet novel, if not incredible, to the great body of the medical profession, we are aware that we are exposing ourself to much animadversion; but conscientiously believing them to be correct, we shall not shrink from proclaiming them. They will not appear so novel or astounding to many of the ablest and most successful practitioners of the South; though to the extent we have gone they are neither generally known or received. The sedative powers of large doses of quinine, given during the early exacerbation of our summer and autumnal fevers, both remittent, bilious and yellow, have been proclaimed by some of the physicians of this city, by the army surgeons, and by the physicians of the Southern States, in the Medical Journals, for the last ten years. We perceive that these views are gradually extending to the North, and will certainly take there if properly tested; but it will require some time to prepare the minds of our northern brethren for such a revolution in therapeutics as they must effect when established.* The wonderful powers of the sulphate of quinine over the yellow fever of New Orleans are briefly but forcibly set forth in the essay of the late Professor John Harrison, to be found in the second volume of the New Orleans Medical and Surgical Journal. Also by Dr J. Beugnot, a prominent French practitioner of our city, in the first volume of the same Journal. Dr B. informs us, in a recent conversation, that notwithstanding the favourable mention he then made of the abortive method, by large doses of quinine immediately after free blood-letting, he did not adopt it, but relied chiefly on the lancet alone. He says he is now strongly inclined to think that the former is the very best practice that can be followed in yellow fever. The older physicians, both North and South, may be expected to set their faces against them as they have ever done against all innovations; but the younger ones will be apt to adopt them if they practice in the South. Quinine is given in five or ten grain doses by a number of physicians of this city and the Southern country, who have not yet adopted the abortive method. This is a great improvement, but they will go farther after a while. We saw twenty grain doses with twenty-five or thirty drops of laudanum given at the Charity Hospital, in the early stages of yellow fever, by physicians, this season, who would have shuddered at such a prescription three years ago.

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* See the "discussion on the powers of quinine in remittent fevers" in the Philadelphia County Medical Society meeting of December 1849; published in the Medical Examiner for Feb. 1850. The remarks of Drs Parrish, Jewell, and John Bell, are decidedly favourable to large doses, whilst the President, Dr S. Jackson of Northumberland, clings to the old notions. If these gentlemen could see a few practical illustrations of the "abortive method" they would doubtless be delighted as well as astounded.

We had not expected to say so much about quinine as we have done in this article, but made it the subject of a special report. Our pressing engagements, however, do not allow time to prepare such a report for this volume. The addition of another year's experience will qualify us better for the performance of this duty.

We have said all that we deemed necessary about the yellow fever of 1849. We are entering upon a year which, if it correspond with that which followed the previous great overflow in 1817, will afford extensive opportunities for investigating every thing relative to yellow fever.

The foregoing report is an important document, in giving confirmation to the opinions entertained by Dr John Hunter, Dr Jackson, Dr Bancroft, and similar able observers, on the relation between yellow fever on the one hand, and intermittent and remittent fever on the other. The facts furnished by the experience of New Orleans for nine years leave no doubt in the mind of Dr Fenner, that yellow fever has the same origin, telluric and atmospherical, as intermittent and remittent fever. It is only a degree more intense, and depending upon a more concentrated form of the same poison. The inference is unavoidable, that it is not contagious nor susceptible of exportation, any more than ague and remittent.

It ir further important to observe, that Dr Fenner has the candour to admit, that it is quite impossible in the early stage to say, whether any given attack is to be merely remittent, or to turn out yellow fever.

Regarding the application and use of the term epidemic we see no difficulty. We can understand what all experience has proved, that in certain seasons these fevers are merely endemic, that is, arising from the soil and confined to the locality; but that, in other seasons, marked by peculiar characters, these distempers acquire an epidemical character, that is, prevail extensively in a community and affect great numbers, yet without acquiring contagious characters. The air simply is distempered.

The efficacy of quinine given without delay in these disorders has been demonstrated by several physicians, but recently by Dr John Imray in the 70th, and Dr J. C. Cameron in the 71st volumes of this Journal.

PART II.

CRITICAL ANALYSIS.

ART. I.—1. PHARMACOPŒIA COLLEGII REGALIS MEDICORUM LONDINENSIS. LONDINI MDCCCLI. 8vo. Pp. 196.

2. *A Translation of the New London Pharmacopœia, including also the New Dublin and Edinburgh Pharmacopœias, with a Full Account of the Chemical and Medicinal Properties of their Contents; forming a Complete Materia Medica.* By J. BIRKBECK NEVINS, M.D., London, M.R.C.S., and L.A.C.; Medical Officer to the West Derby Union Hospital; Lecturer on Chemistry in the Collegiate Institution, and on Botany in the Medical School, Liverpool, &c. London, 1851. Large 12mo. Pp. 780.

3. *A Compendium of Materia Medica and Pharmacy, adapted to the London Pharmacopœia, embodying the New French, American, and Indian Medicines, and also comprising a Summary of Practical Toxicology, with the Abbreviations used in Prescriptions.* By J. HUNTER LANE, M.D., F.L.S., F.S.S.A.; Corresponding Member of the Calcutta Medical and Physical Society; Member of the Royal College of Surgeons, &c.; formerly President of the Royal Medical Society, Edinburgh, &c. Second Edition. London, 1851. Small 12mo. Pp. 310.

4. *The Prescriber's Pharmacopœia, containing all the Medicines in the New London Pharmacopœia of* 1851, *arranged in Classes according to their Action, with their Composition and Dose.* By a PRACTISING PHYSICIAN. Fourth Edition. London, 1851. 32mo. Pp. 132.

5. THE NEW LONDON PHARMACOPŒIA. *Translated and arranged in a Tabular form, with the Edinburgh and Dublin Pharmacopœias; showing at one view the Differences in the*

FORMULÆ *of the Three Colleges, together with the Tests given by each College for the Purity of the several Preparations; with Practical Remarks.* By PETER SQUIRE, M. R. I., Chemist on the Establishment of the Queen, H. R. H. the Prince Albert, H. R. H. the Prince of Wales, and the Royal Family. London, 1851. Large 8vo. Pp. 174, with Appendix of pp. 25.

THE art of preparing, compounding, and combining medicines for the cure of diseases has at all times of the history of medicine formed an important branch of medical study. The reader of Celsus may see in the first twenty-five chapters of the fifth book, and in various chapters of the sixth book of that writer, the usual combinations which were employed among the Greek and Roman physicians. Scribonius Largus, who is understood to have flourished, according to some, during the reign of Augustus and Tiberius, according to others during the reign of the Emperor Claudius, has left, under the title of *Compositiones Medicæ,* a work of the nature of a dispensatory, which appears to have been translated from the Greek.

A considerable source of anxiety with the ancient physicians appears to have been the dread of poisons, their sudden and violent operation, and the search after such means as might most certainly oppose and neutralize their effects. Part of this dread most probably originated with the poets, to whom the reputed effects of the poisons of Æson and his daughter Medea formed a most indispensable stock for poetical invention. If we judge from the treatises written on the means of counteracting the effects of poison, we shall infer that they occupied quite as much, if not more attention, than the means of curing of diseases and ordinary wounds. The subject was divided by the ancient physicians into two parts,—one *Alexipharmaka,* or the means of counteracting poisons, and preserving against their effects; the other, *Theriaka,* or the means of curing the effects of the wounds of animals reputed poisonous. On these two subjects, Nikander, a native of Colophon, one of the earliest authors, who flourished about one hundred and thirty-seven years before the birth of Jesus Christ, composed poetical treatises, which were highly esteemed by his successors, and from which almost all of them copied more or less freely.

From this circumstance it has resulted that almost all those who have treated of *Materia Medica* have treated of poisons, and all those who have written on poisons have communicated more or less of the ideas of the day on medicines and their uses.

Pedanius, or Pedacius of Anazarba, a town in Cilicia,[*] known most commonly by the patronymic of **Dioscorides**, was a naturalist and botanical writer, who lived in the reign of Nero. The extant works of Dioscorides consist of five books on *Materia Medica* and Pharmacy; one treatise on Alexipharmacks, or antidotes to poisons; one treatise on Theriaka, or the Means of Counteracting the Effects of the Poisons of Poisonous Animals; and two books on Euporistics, or medicines of easy preparation. In the first book of the treatise on *Materia Medica*, (Υλη Ιατρικη), he gives accounts of all the plants, trees, and shrubs, from which were produced aromatic substances, oils, ointments, liquors, and balsams used in medicine. In the second he treats of the animals from the bodies of which are obtained various substances, as honey, milk, various sorts of oil and fat, and different animal secretions and products employed by the apothecary; and afterwards he describes various vegetable substances employed either as food, as condiments, or medicine, not described in the preceding book, especially the cereal grains, and the ordinary garden culinary vegetables. The third book is devoted to the history of the roots, juices, herbs, and seeds possessing medicinal properties; and some of the aromatic plants, as mint, different sorts of thyme, origanum, dill, anise, carraway, cinnamon, fennel, and similar articles. In the fourth book this history is continued and completed. In the fifth book he treats of the different vines and its varieties, the grape and wine; water, fresh and salt; vinegar, oxymel, and the medicated wines and vinegars; and concludes with the description of the metallic bodies and mineral substances used in ancient practice.

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[*] Sometimes Anazarbus.

The Treatise on Euporistic Medicines, or those of easy preparation, corresponding in many instances to extemporaneous preparations, contains much useful information, and shows how much attention was anciently bestowed on this subject.*

The work of Dioscorides must be allowed to be the most systematic and comprehensive treatise on *Materia Medica* and Pharmacy in ancient times.

The voluminous work of Pliny the Elder (*Major*), which was intended as a sort of general history of the material world, contains, further, much information regarding the alleged medicinal uses of various articles; and, if it were possible to make the selection from a work so large and so desultory, the notices regarding the ancient *Materia Medica* would form a very respectable volume, and one not unserviceable.

Galen, however, is the great depository of all the medical learning of antiquity. In the edition of his works, as published by Chartier, the last part contains his labours on *Materia Medica* and Pharmacy. Three treatises or chapters, the first on the properties of simple medicines, the second on the composition of medicines according to the diseases in which they are indicated, and the third on the composition of medicines according to their physiological effects, contain the main facts which this laborious writer had been able to collect from personal experience and that of his predecessors.

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* Πεδακιου Διοσκοριδου του Αναζαρβεως τα Σωζομενα Απαντα. Place not mentioned. 1598. License of publication dated at Vienna, 1582.

Themison is supposed to have invented the compositions called Dagridium and Diacodium. Apuleius Celsus of Centorbi, in Sicily, among other antidotes, describes one against rabies, of some celebrity, consisting of opium, castor, pepper, and similar substances. Herennius Philo of Tarsus acquired reputation in devising a soothing or quieting composition to which the name of Philonium was afterwards given. According to Galen this preparation, which was employed chiefly in allaying the pains of colic, was composed by uniting in different proportions, opium, saffron, the root of pellitory, euphorbium, white pepper, hyoscyamus, nard, and Attic honey.

The Arabian physicians, and the European followers and pupils of these authorities devoted great attention to the subject of the selection, preparation, and combination of medicines; and while they were by no means anxious about elucidating the true nature of diseases, either by anatomy or by observation, they were most solicitous to find in the products of the vegetable world, the mineral kingdom, and the bodies of animals, substances which they believed might exercise a powerful influence over the diseases of the human body. Various circumstances led them to the study of chemistry; and though it was in their hands a rude and imperfect art, formed higher pretensions than nature allowed, their knowledge of it led them to devote much time and attention to pharmacy. With them originated the great problem of the transmutation of metals, or the conversion of the common metals into gold and silver. In the eighth century flourished Geber, to whom is ascribed the composition of a work on alchemy, which still passes under his name. From this performance, which is probably to be regarded as a collection of the alchemical and chemical knowledge of that time, it appears that various preparations of mercury, as corrosive sublimate and red precipitate were known, that nitric and nitro-muriatic acid, or *aqua regia*, and nitrate of silver, were also familiar articles. The deep impression which the alchemical and pharmacological knowledge of the Arabians left upon the art of dispensing medicines may be inferred from the number of terms which, more or less immediately deduced from the Arabian language, are still in use in various European languages. Such terms as *alkohol*, *alkali*, *julep or gulab*; *lohoch or looch from alkuak*; *naphtha from nefth*; *camphor*, *from kafour*; *syrup* from *schirab*; *bedeguar* from *bedawar*; *bezoar* from *badezohr*; and others too numerous to recount, must be regarded as the vestiges of that knowledge, which was supposed to be most familiar to the Arabian doctors.

It is further stated upon the authority of Abulpharagius that the Arabian physicians were the first who united in composing *formulæ*, or directions for the preparation of compound medicines; and that Sahor-Iben-Sakel, director of the school of Gondisapour, published during the second half of the ninth century, under the title of *Krabadin*, the earliest dispensatory known. This was followed by others; of which that by Abu l Hassan-Hebatollah Iben O Talmid, bishop and physician to the Caliph of Bagdad, enjoyed in the twelfth century high celebrity, and was used as the standard guide for the Arabian apothecaries. These treatises were under the immediate inspection of the government, which it is said took particular care to enforce two conditions quite incompatible, that the medicines should not be adulterated, and should not be sold at too high a price. According to the same authority, the Governor General Afschin visited personally the dispensing magazines of his army, in order to be certain that these establishments contained all the medicines specified in the dispensatories.

All the Arabian physicians distinguished themselves by peculiar doctrines regarding the alleged virtues and uses of medicines. Mesues the elder was partial to the use of mild purgatives, excluding the active medicines used by the Greek physicians. Alkhindi endeavours to recognize geometrical relations in the degrees of medicines. Rhazes appears to have made use of arsenical preparations externally, and even to have administered the less active ones occasionally in dysentery. All of them ascribed to medicines, virtues and properties, which, trusting to observation only, it will be difficult to admit.

The most anthoritative authors on *materia medica* and pharmacy among the Arabians were Serapion the younger, and John Mesues of Damascus, commonly called Mesues the younger.

The former, who is supposed to have lived in the end of the tenth century, some time after Aben-Gnefith and Rhazes, has left a treatise which combines at once the knowledge of the Greeks and the Arabians on the natural history and reputed powers of medicines. The work of Serapion is entitled *Liber Aggregatus de Medicinis Simplicibus*, and was translated from Arabic into Latin by Abraam, a Jew of Tortosa, and *Simeon Januensis*. The author informs his readers in the beginning of this treatise, that he had seen the treatise of Dioscorides and Galen, and that he considered them sufficient in information; but that they were separate; and that it was his intention to write a work which should unite the information of both the Greek physicians with the more recent matter of the Arabians. He divides his discourse into three parts; the first on simple medicines derived from the plants; the second on simples derived from minerals; and the third on those derived from animals. The first division is the most elaborate and ample.

The method of Serapion is to give in general first what Dioscorides and Galen state of each article, and then to subjoin his own additions and comments, which may be understood to represent the current doctrines of the Arabian physicians. The Arab titles of each article are given, and along with them the Latin equivalent.[*]

It may be here mentioned that there is a treatise published by John, the son of Serapion, entitled *De Antidotis* and *Antidotarium*. This treatise, which forms the seventh and last part of the same author's work on Practice of Medicine, is a system of *Materia Medica* and Pharmacy, and is in all respects similar to the other productions of this period. The tractate, or book, is divided into thirty-seven sections or chapters, in which John treats successively of simple medicines and compound preparations, and gives full directions for preparing electuaries, confections, pills, tinctures, and similar articles; and in the thirty-seventh he describes the weights and measures employed.[†] The term *Antidotarium* to designate a system of *Matera Medica* and Pharmacy is in these days, as we shall see, in frequent use. It is afterwards defined by *Jacobus Sylvius* in his commentaries on Mesues as "that which contains descriptions of antidotes, that is medicines which are not applied externally, but which are taken into the system and heal its disorders."[‡]

It has been seen that there are in the history of Arab medicine two persons bearing the name of Mesue or Mesues, corresponding to Moses of the Israelites,—the elder and the younger. The person best known, if not the only one known by his writings, is John Mesues of Damascus, who is represented to have been a pupil of Avicenna, and to have lived at Cairo with the Khalif Alkaken. He died in the year one thousand and twenty-eight of the Christian era. He is said by Sprengel to have been the son of Hamech, and to have been born at Maridin, in the banks of the

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[*] Liber Serapionis de Simplici Medicina. Impressum Venetiis mandato et expensis Nobilis Viri Domini Octaviani Scoti Civis Modoetiensis per Bonetum Locatellum Bergomensem. 17 Kaliendas Januari 1497. 16th December 1496.

[†] Practica Joannis Filii Serapionis Dicta Breviarium. Extat apud Eundem. This forms the first part of the volume referred to in the previous note.

[‡] Antidotarium est vocatum quod contineat descriptiones Antidotorum, hoc est Medicamentorum quae non foris admota corpori, sed in corpus recepta, affectus medentur. Jacobi Sylvii, Annotationes, in Joannis Mesuae, Grabadin, p. 84. Lib. Primus.

Euphrates. The accuracy of this statement is questionable· What is certain is that one of his treatises commences in the following manner :—" In the name of the merciful God, by whose nod speech receives favour, and learning acquires perfection, be the beginning of the words of John, the son of Mesues, the son of Hamech, the son of Hely, the son of Abdela, king of Damascus." It thus appears that Hamech was the grandfather, not the father of John of Damascus. He is called by his commentators John Mesues of Damascus; and one of them, Francis of Piedmont, charges him with absurdity and vanity, because he traces his descent from Abdela, the king, or Khalif rather,, of Damascus.

His works are certainly the most ample that the Arabians have left upon the subject of *Materia Medica* and Pharmacy ; and it is manifest that they were accounted of high importance and value both by contemporaries and successors.

On these subjects two works are extant. One is on the simple purgative medicines, which are distinguished into three orders ; *Cholagoga, Phlegmagoga*, and *Melanogoga.* From this it appears that the term *purgative* was used in a more general sense than by the modern writers. The treatise consists of two books, one entitled *Canones Generales,* on the general effects of this order of remedies; in the other, the second book, he treats of the effects of individual purgative agents. This first treatise, though translated anciently by one of the Jew interpreters, was again translated by *Jacobus Sylvius*, and was illustrated by the commentaries of John Costaeus, Mondinus, and Manardus.

The most complete work, however, of John Mesues is that which is denominated GRABADIN, GRADIN, or GRABATIN, which corresponds to the Latin term *antidotarium*, and which the translator interprets as *Compendium Secretorum Medicamentorum.* In short, GRABADIN or GRABATIN is simply Dispensatory. In the first or ancient translation GRABADIN is rendered Aggregatio et Antidotarium Electuariorum Confectionum et Aliorum Medecinarum Compositarum. In the GRABADIN of Mesues, the author, treats of electuaries, opiate medicines, solvent or laxative medicines, preserved medicines, that is, fruits, rinds, roots, and extracts preserved in sugar ; loochs or linctuses, (eclegmata) ; robub or inspissated juices ; syrups ; infusions and decoctions; lozenges; powders ; pills ; ointments and plasters; oils, simple and medicated ; pouches, a species of sacculated poultices ; inunctions ; sternutatories ; epithems and clysters ; and lastly, ptisans, or the vegetable infusions and decoctions. Upon the directions contained in this treatise notes, additions, and commentaries were written by Christopher Georgius de Honestis of Florence, Jacobus Sylvius, John Costaeus, Manardus, and other learned persons, so that the text of Mesues, with these explanations formed a complete system of knowledge on Materia Medica and Pharmacy.

The additions of Peter de Abano on the first performance of Mesue, and those of Christopher de Honestis, on the GRABADIN, were written and published about the close of the fifteenth century.[*] Those of Costaeus, Manardus, and Sylvius were published at Venice in 1623;[†] and it is manifest, from various circumstances, that in the whole of the sixteenth century, and at least the early part of the seventeenth, the Materia Medica and Pharmacy of Mesues were held in high esteem among physicians. The authority of Mesues is repeatedly quoted by the writers of these times; and several of his prescriptions and combinations are given in terms of commendation. This appears particularly in the writings of Valerius Cordus, which shall be afterwards noticed.

It seems to have been the opinion of John Mesues, that the GRABADIN, or Dispensatory, a mere description of medicines, and their uses and modes of administration, would be incomplete and unserviceable, unless the morbid states of the human body in which they were required, were also explained in sufficient detail. In the second book of the performance, accordingly, he gives a short view of all the infirmities and diseases incident to the human body, and the most probable methods of curing them; or, as he expresses it, the remedies suited to the diseases of the individual parts of the body. In this discourse, however, there is little upon the distinctive characters and nature of diseases. Mesues still adheres to his great object of combining and administering medicines.

It may be here mentioned, that there are extant several other Arabian treatises of some authority; one by Al Ben Gnefit, that is, the son of Gnefit; and the other by Al Chindi;[‡] and a third, the book called the SERVITOR of Bulchasin, Ben Ab Erazerin.* The first two are mostly upon certain numerical relations, according to which these authors wished to arrange medicines. The third is more of a dispensatory or pharmacopoeia.

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[*] Mesue cum Additionibus Francisci de Pedemontium et Additionibus Petri de Apono. Et cum Commento Dini super Canones Generales. Et cum Commento Christophori de Honestis super Antidotarium Mesuae. Platearius super Antidotarium Nicolai et Saladinus de componendis medicines, pp. 291. Explicit Tractatus Synonymus Impressus Venetiis per Peregrinum de Pasqualibus Bononiensem. Anno Domini 1486, Die secundo Decembris. Regnante Inclyto principe Agustino Barbadiis.

At end of another tract in the same volume called Servitor, by Bulchasin Benaberazin, is the following:—Impressa Venetiis per Peregrinum de Pasqualibus de Bononia sub Anno Domini 1491, die 13 Mensis Julii. Duce serenissimo et inclyto Principe Augustino Barbadiis.

[†] Joannes Mesuae Damasceni Medici Clarissimi Opera. De Medicamentorum purgantium Delectu, Castigatione et Usu Libri Duo. GRABADIN hoc est Compendium Secretorum Medicamentorum Libri Duo; Quorum Prior ANTIDOTARIUM; posterior de appropriatis vulgo inscribitur. Cum Mundini, Honesti, Manardi, et Sylvii Observationibus. Venetiis apud Juntas. MDCXXIII. Folio, pp. 252.

[‡] Al Ben Gnefit Libellus in quo de simplicium Medicinarum et ciborum virtutibus in generali et speciali brevissime et ordinatissime pertractatur. Extat apud supplementum Mesuæ Operum.

[†] Jacob Al Chindi Auctoris praestantissimi de Medicinarum compositarum gradibus investigandis Libellus. Extat cum eodem.

The times at which the authors of these writings lived are not perfectly ascertained. Al Ben Gnefit is supposed to have preceded Serapion, because the latter mentions an author of that name.

Towards the end of the thirteenth century lived John, the son of Zachariah, physician at the court of Constantinople, where he bore also the name of ACTUARIUS, a title occasionally conferred by that court on physicians. Besides a compendious treatise on medicine, founded chiefly on the Greek physicians, he wrote a small treatise on compound medicines, which may be regarded as the most useful and judicious that had for a long period appeared. Though not free from the faults of the period, it has the advantage of being more condensed than previous works, and communicating all the necessary information.†

Actuarius is the first among the Greeks who mentions and describes the milder sorts of purgatives, as cassia, manna, senna, and myrobalans. The two last medicines, he states, were imported from foreign countries, namely, Syria and Egypt, into Constantinople. What he states concerning these medicines he allows he derived from the Arabians, who certainly first employed them.

The Arabians appear also first to have introduced the practice of conserving medicines by means of sugar and honey, and forming *condita* or conserves, syrups and juleps; and upon these preparations Actuarius is the first European authority who speaks at large.

Another article, not mentioned by the Greek pharmacologists, is that of distilled liquors, which appear to have included not only pure distilled spirits, but the essential oils either alone or combined with alkohol. Two articles make a considerable figure among the authorities; the one is *Rhodostagma*, and the other *Intybostagma*. The first is supposed to have been a distilled liquor from rose-leaves, the other a similar preparation from endive. But the truth is, that the Arabian pharmacologists have many preparations of this kind; and there is little doubt that, by means of Actuarius, and contemporary or subsequent writers, the knowledge of these was introduced to the apothecaries and physicians of other European countries.

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* Incipit Liber SERVITORIS, Liber xxviii., Bulchasin Ben Ab Erazerin. Translatus a Symeone Januensi. Interprete Abraamo Judeo Tortuosiensi. Extat apud Mesuæ Opera Venetiis, 1491.

† Actuarii Joannis Filii Zachariae, Operum, Tomus iii. De Medicamentorum Compositione. Lugduni, 1556. 12mo.

When medicine began to be practised by the monks, ecclesiastics, and other Europeans in the fifteenth century, the traces of Arabian habits, Arabian doctrines, and Arabian nomenclature were still predominant, and deeply marked. During that century, indeed, many European authors seem to have copied very closely the books of the Arabians, either because they believed that these books contained all that was requisite to be known, or because they thought it not safe to depart from them. This at least is true of several of those whose writings have been preserved.

We first encounter, in studying to disentangle the history of these times, some confusion with regard to one person, whose name has been associated with the earliest European antidotaries. Nicolas or Nicolaus, surnamed *Praepositus*, which in these times is equivalent to prefect or provost, was director or head of the school of Salerno in the first half of the twelfth century. This person compiled an *Antidotarium*, at the solicitation, he states, of certain persons wishing to study practical medicine, that he might teach them properly the method of preparing and dispensing. This performance is not entitled to much praise. It is avowedly compiled from the Greek and Arabian authors, not very judiciously. It was, however, at that time the only dispensatory; and it was not only the ordinary guide to the physician and apothecary at that time, but it was long afterwards translated into English, and under the name of Praepositus's Practice, became a sort of text book to English practitioners. Soon after the *Antidotarium* was written it was thought worthy of various commentaries. The first was the Expositions and Glosses of John Platearius, who is supposed to have been Professor at Rome in the fifteenth century.[*] Along with this exposition are mingled the annotations of an anonymous German author. Lastly, John de Saint Amand, a canon of the Church of Tournay, in Belgium, wrote upon the Antidotary a continuous exposition, which shows much learning and knowledge.

Nicolaus, surnamed *Praepositus*, must be distinguished from another physician of the same name, who is known as Nicolaus of Alexandria, and who is believed to have practised at Constantinople in the thirteenth century. The *Nicolaus Praepositus* is called by the authors of the Report of the College of Physicians, presented in 1745, *Nicolaus of Tours*, and they seem to regard him as different from Nicolaus of Salerno. But it is probably sufficient to observe, that whether there were two distinct persons or not, the *Antidotarium*, meagre and imperfect as it is, is regarded as the earliest European work on Pharmacy.

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[*] The first edition of Nicolaus' Antidotarium, with the Commentary or Glosses of John Platearius was published at Venice in 1489.

[†] Expositio Joannis de Sancto Amando Tornacensis Ecclesiæ Canonici supra Antidot. Nicolai, extat in Supplemento Op. Mesuæ.

Subsequent to Nicolaus comes Saladin of Asculo, physician to the Prince John Antony of Balzo, Ursin of Tarento, great constable of Naples. This writer assigns as the reason for his writing on pharmacy the following. " Because the ignorance and unskilfulness of spice-dealers (*aromatarii*), or apothecaries,* is wont very often to lead the most famous doctors and the most learned physicians to infamy and loss, with great peril to themselves; therefore, moved by piety towards physicians, and that I might comply with the entreaties of several druggists, and especially that of a most skilful person, the most worthy druggist of my master, the Prince of Tarentum, I, Saladin, doctor of arts and medicine, physician to the same prince, have undertaken to compose this treatise, which I wish to be entitled The Compendium of Druggists (*Compendium Aromatariorum*), showing how these druggists ought to be examined; and if they are found sufficient and expert in art, I wish that they be approved by the most skilful physicians; but if they are incompetent and ignorant, and shall have failed in examination as imperfect, then that they be altogether disapproved of, and visited with condign punishment."

The Druggists' Compendium by Saladin is divided into seven parts.

The first consists of questions to be proposed to druggists to ascertain their competency, and various doubts and queries regarding the Antidotary of Mesues then in use.

The second is on the names of the compound medicines described in the Antidotary of Nicolaus.

The third part is on weights and doses of medicines.

The fourth part treats of the methods of preparing confections, electuaries, juleps, syrups, ointments, and similar compounds; a branch of art to which, at that time, very great importance was attached.

The fifth part gives instructions for the collection of herbs, flowers, seeds, and roots, and specifies the time and the month of the year in which each ought to be collected.

The sixth part treats of the preservation of simple and compound medicines, according to the rules delivered by Mesues, Serapion, Nicolaus, the Servitor, and the author himself.

The seventh and last part is on the method of arranging medicines in the laboratory or shop, *(in qualibet Aromataria vel apotheca);* with lists of the same after Mesues, Serapion, Nicolaus, Al Rhasi, and Avicenna.

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* Literally perfume dealers. But *aromatarii* means properly Druggists and Apothecaries. *Aromatarius* is literally Dealer in spices, and, as such, it has equivalents in most of the European languages; Epicier in French, Spetiali in Italian, der spezerey-handler, gewurzhandler in German. In the English, grocer, alone, it appears to have lost its original signification. But this is probably more apparent than real; for the grocers were originally apothecaries and druggists also during the twelfth and thirteenth centuries, before druggists existed as a separate body of dealers; and they were then denominated *Pepperers.*

This treatise, which is believed to have been written about the year 1447 or 1450, contains ample and satisfactory information regarding the state of pharmacological knowledge at that time. The facts which it records say little either for the science or the common sense of the day. But in forming a judgment, we must not forget the state of society and the general ideas then prevalent. Many parts of it are composed in the form of a catechism, with questions proposed and answers subjoined; yet the answers often show much ignorance. Saladin mentions that to every druggist at that time seven books were necessary; namely 1 and 2, the two books of Avicenna and Serapion on Simples; 3, the book of Symeon Januensis on Synonymous terms; 4, the book of the SERVITOR, which contains the preparations of almost all the articles necessary for druggists; 5, the book of John Mesues; 6, the *Antidotarium* of Nicolaus of Salerno, of which, he says, there are two, the large, which, though the best, is little used, and the small *Antidotarium*, which all are in common use; 7, the book entitled from the beginning words CIRCA INSTANS, of which also he speaks favourably; and lastly Dioscorides and Macer.

Saladin inculcates strongly on the apothecary the necessity of having good moral principles; that he should be upright, just, and pious, particularly to the poor; that he should not be an extreme lover of money, nor sell articles at a higher than just price; that he must not give to a pregnant female medicines to induce abortion; and that neither through dread of superiors or for money he should sell poisonous medicines, or prepare poisoned draughts, or presume to employ honey in preparing medicines which ought to be made with sugar.

These trifling facts show the state of society as well as the state of pharmacy in these days. Saladin himself observes that if any one wishes to know whether the fœtid odour can be removed from opium, he answers that this may be effected by means of garlic; that is by pounding one ounce of opium with two heads of garlic, and then distilling the mixture by means of an alembic. Of the distilled liquor thus resulting, doses may be given at discretion, because it wonderfully induces sleep, and is free from the strong odour of opium. "And if any one," he adds, "shall use this secret with nefarious intent, except to the purpose of medicine, let him be accursed of God."

"No apothecary," he states, "should be permitted, in preparing a medicine, to substitute one article for another; and if he has not any simple article required, he must obtain the dispensation and authority of a most learned and faithful physician." He adds, that in his time, the illustrious sovereign of the Aragons severely punished and condemned at Naples an apothecary whom the physicians of his majesty had ordered to prepare a cordial electuary. One of the ingredients of this electuary was white coral; and the apothecary, who had no white coral, burned some red coral, which was thus rendered white. For this substitution, which came to the knowledge of his majesty, he was sentenced to pay a fine of 9000 ducats, and prohibited in all time coming from ever exercising the function of the apothecary.

Such was the justice of the mild and sagacious government of Sicily in those good old times. It is scarcely necessary to observe that red coral is carbonate of lime and some animal matter, and that when burned it is converted into quicklime, which, without doing harm, might be more efficient as an antacid than the carbonate. Of this, however, the apothecary was not permitted to judge.

The treatise of Saladin is formed principally after the model of that of Nicolaus of Salerno, to whom he often refers, and upon whose formulæ he generally merely comments.[*]

With regard to the treatise called CIRCA INSTANS, abovementioned, these were the first words of a treatise, *De Simplici Medecina*, by John Platearius. "Circa instans negotium de simplicibus medecinis nostrum versatur præpositum." This treatise is in alphabetical order, and is a sort of dictionary of *Materia Medica*.[†]

From the circumstance of his mentioning this, and the other works above enumerated, as necessary to the apothecary, it seems that Saladin did not look upon his own performance as so complete as entirely to supersede these books. It is more probable that he composed it as a short guide to the apothecary in the ordinary operations of his calling, who was expected to read and refer to, when requisite, the other authorities then in use.

Another work which has been mentioned as written on *Materia Medica*, during the fifteenth century, is the treatise of Santes Ardoynus, a physician of Pesaro, on Poisons. This person practised at Venice, where, according to the testimony of his editor, Theodore Zuingger, he wrote his treatise as early as about 1426. The treatise is divided into eight books; the first on the nature of poison and its differences, its causes and symptoms in general;

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[*] Domini Saladini de Asculo, Serenitatis Principis Tarenti Physici Principalis Aromatariorum Compendium feliciter incipit. Extat apud Mesue opera. Impressa Venetiis per Pelegonium de Pasqualibus de Bononia sub anno Domini 1491, die 19 mensis Julii. Folio. P. 15.

[†] Incipit Liber de Simplici Medicina Secundum Joannem Platearium Dictus CIRCA INSTANS. Impressum Venetiis. Mandato et Expensis Nobilis viri Domini Octaviani Scoti, Civis Modoetiensis per Bonetum Locatellum Bergomensem, 17 kalendas Januarias 1497. Extat cum Practica Joannis Serapionis.

the second on particular poisons, especially the metallic ones; poisoned waters and poisonous air or vapour; the third on the vegetable poisons; the fourth on the animal poisons; the fifth on the general preservation against and the treatment required to counteract the effects of poisons, and among others poisoned wounds; the sixth on the poison of reptiles and fishes; the seventh on bites of men and animals, and wounds from the talons of birds; and the eighth on the poisons from minute insects.

This work, which is an elaborate compilation from the principal Greek, Roman, Jewish, and Arabian authors, cannot, properly speaking, be styled a work on *Materia Medica.* It certainly contains the information collected up to that time upon almost every substance employed either as poison or as remedy, and many of the reputed poisons were substances employed, as in the present day, in the treatment of diseases and the alleviation of painful complaints; and in this sense it unquestionably embraces the knowledge of the day on *Materia Medica.* But the main and professed object of the author is the explanation of the effects of poisons and the proper means of obviating them. It must also be allowed that many of the articles of which Santes Ardoynus treats are not poisonous. His work on the whole must be allowed to be a fair compendium of the knowledge of the day, containing much curious information, more elaborate than judicious, and certainly much tinged with credulity and fanciful speculations.*

Of this author Sprengel has made mention in such terms that they are calculated to make the reader think, that he must have obtained his information from some doubtful authority, and without having seen the work The name Santes Ardoynus he converts into Saint Ardouin.*

It is to be observed that during the whole of the three centuries now referred to, from the end of the twelfth, to the end of the fifteenth, the business as well as the knowledge of the apothecary was in a very rude and imperfect condition. Excepting in Italy during the fifteenth century there was scarcely in any European country such an establishment as an apothecary's shop kept by an apothecary. In the towns of Germany and France medicines were kept chiefly in the shops of the spice-dealers or grocers, who dispensed them, often at very high prices, to the inhabitants who wanted these expensive luxuries. Another trade often exercising the calling of the apothecary was that of confectioners, who, in many of the towns of Germany, were ordered, as a reward for the license of selling drugs, and preparing medicines, simple or compound, to supply the common chambers of the town with a certain quantity of preserves and confectionary. One of the earliest notices of an apothecary's shop is that which is mentioned as being kept by a citizen of Munster, named Willeken, in the year 1267 in that time. The first persons who opened druggist shops at Leipsic were certain emigrants from Prague in the twelfth century; and it is probable that these persons were Jews, who at that time were at once the depositaries of much of the learning of the day, and who often practised medicine, and supplied remedies for the cure of diseases. It appears further that in the year 1285 there was a druggist's or apothecary's laboratory at Augsburgh. This, however, some persons regard as resting on uncertain authority. The earliest authentic fact of the existence of an authorised apothecary's shop is that established in the town of Halle in 1493. In the instructions which Simon Puster, the first apothecary of this town, received from the magistrates, it is stipulated, "that for the permission, he must, and will, give to us, and to our descendants, two collations during Lent, and to the Town-House, eight pounds of sugar, well confected, as a suitable accompaniment to these collations."[*]

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* Santis Ardoyni Pisaurensis Medici et Philosophi praestantissimi, Opus de Venenis, a multis hactenus desideratum et nunc tandem castigatissimé editum. Basileae, Idibus, Januarii 1562. Folio, p. 514.

In Paris it appears from the facts ascertained by Astruc and Félibien that certain persons had united themselves as apothecaries in the fifteenth century, and that the statutes regarding their proceedings were promulgated in the year 1484. At this time it appears that all medicines and drugs were brought from Italy, partly because there the apothecaries were, on the whole, a better instructed body, partly because from the large towns of Amalfi, Venice, Leghorn, and Genoa, being the usual entrepots of the merchandise of the East, all the most valuable exotic medicines were there most easily procured. A few medicines might be brought overland by Constantinople to the towns of Eastern Germany; but the great amount of articles required by the apothecary were brought first to Amalfi, Venice, Leghorn, or Naples, and thence distributed over Europe.

In London for a long period, probably several centuries, the same practice was followed. Spices, drugs, and aromatics of various kinds, the productions of eastern countries, were imported in considerable quantity in the end of the eleventh and in the course of the twelfth and thirteenth centuries, because these articles were much used by persons of rank and fortune in the preparation of various articles of food and drink, and by physicians in the composition of their medicines.‡ "The Sabeans," says Fitzstephen, "import into London frankincense and other spices; and from the rich country about Babylon they bring the oil of palms." The spice-trade formed a branch of commerce so important in the eleventh and twelfth centuries that merchants in general are often called *Speciarii*, in the barbarous Latin of those times.* This term *speciarius* afterwards became the Italian *Spetiali*, and the French *Epicier*, to denominate the grocer. In England at this period the equivalent term was *Pepperer*. These pepperers or spice-dealers were all over Europe during the eleventh, twelfth, and thirteenth centuries, the only furnishers and venders of medicines. When compound medicines were required, they were usually prepared by an ecclesiastic, who was supposed to possess the requisite learning, or by some of those who acted also as physicians and surgeons.

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[*] Dreyhaupts Beschreibung der Zirkel de Saal, Band ii. Seite, 561.

† Astruc Memoire, p. 32. Felibien Histoire de Paris, vol. ii. p. 927.

‡ Du Cange Voce *Species*; *Aromata.* Henry's History of Great Britain, volume iii. 4to. Book iii., chapter vi.

Anderson observes that Edward the Third settled on *Coursus de Gangeland*, who is said to have been an apothecary, an allowance of sixpence per day for the care and attendance which the said *Coursus de Gangeland* bestowed upon the king, while he lay ill in Scotland. This illness was in the year 1336, and the grant was made from Westminster, 10th of October 1345.† Though this person is said by Rymer and Anderson to be an apothecary, yet in all probability he was such a medical practitioner as these times afforded.

In the time of Queen Elizabeth, Bucklesbury, or Bucklersbury, as it is sometimes named, was inhabited by chemists, druggists, and apothecaries. Mouffett, in his Treatise on Food, calls on them to decide whether sweet smells correct pestilential air or not; and adds that Bucklesbury, being replete with physic, drugs, and spicery, and being perfumed, during the time of the plague, with the pounding of spices, the melting of odoriferous gums, and the making of perfumes for others, escaped the great plague which produced such a large mortality.‡

It is probable that the number of persons who sold drugs and compounded medicines must have been very much increased in the following reign; for we find that a charter of incorporation was granted to the London apothecaries in the year 1617.

Within the precincts of Blackfriars was erected in 1670 Apothecaries' Hall. Previous to this time, consequently, there was no Apothecaries' hall; and whether there was any body or corporation of apothecaries, Pennant thinks is not ascertained. From an entry, however, in one of the editions of the Chronicle of Stowe, it appears that, in December 1617, the apothecaries of London obtained from James the First, for themselves and their successors, a charter of incorporation by letters patent, constituting them a body politic and corporate, and directing all persons professing the art and mystery of apothecaries within London and its suburbs, and within seven miles compass thereof, to be ordered and governed by the master, wardens, and society of the art and mystery of the apothecaries. The first Master was Edmond Phillips; and the first Wardens were Stephen Higgins and Thomas Fanes.*

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* Muratori Antiquitates, tome ii. Dissertatio 30, p. 881.

† Rymer's Foedera, v., 486. Anderson's Historical and Chronological Deduction of the Origin of Commerce. London, 1764. Volume i., p. 175. Folio.

‡ Pennant's Illustrations to History of London, p. 444.

Though the College of Physicians had existed since the tenth year of the reign of Henry the Eighth, it appears that several years elapsed before they undertook to issue any directions regarding the sale and composition of medicines. This duty, indeed, was first attempted by a foreign city.

We have seen that in the fourteenth and fifteenth centuries the number of books intended to serve as guides to the apothecary and druggist was considerable. These were, nevertheless, very much repetitions of each other, and they contained not a few formulae, which, though prescribing many ingredients to enter into the composition of their respective medicines, differed, notwithstanding, little in the essential articles. These circumstances doubtless led physicians and those in authority to consider whether it might not be more eligible to have one common Register of Formulae, which might serve as a standard guide to regulate apothecaries and druggists in the preparation of medicines. This appears to have been carried into effect in more than one of the cities of the Italian peninsula, at that time the most learned, and, upon the whole, the most civilised country in Europe, in the course of the fifteenth century. The *Ricettario di Dottori dell' Arte e di Medicina del Collegio Florentino*,† or Prescription Book of the Doctors of Art and Medicine of the Florentine College, prepared at Florence in 1448, is mentioned as one intended to guide the members of the Incorporation of Spice-Dealers or Druggists of that city. This, however, could not have been published or made generally known at that time, as the art of printing was not then invented, or in a state to be generally useful.

The first Pharmacopœia or book concerning the preparations and composition of medicines, which was promulgated by any public authority was that by VALERIUS CORDUS, published under the sanction of the senate or municipal body of Nuremberg, in the Upper Palatinate, in the year 1545. This VALERIUS CORDUS was the son of EURITIUS CORDUS, a person described as a celebrated physician. Valerius had been in Italy pursuing his studies, and there had acquired an intimate and correct knowledge of the works principally used by the apothecaries, and of the preparations and compound medicines in most general use. On his return he had come to Nuremberg, and there becoming acquainted both with the learned men and the physicians of the city, he had explained to them the advantages which he thought would result from having a compendium of the medicines most commonly required by physicians and surgeons in the treatment of diseases. He had already, indeed, prepared from all the best authorities a dispensatory or work of the kind, and which had met with the approbation of several physicians, and had been accordingly used in some of the towns of Saxony. This was probably about the year 1542. This performance, after being improved and illustrated by annotations, Cordus presented to the Senate of Nuremberg, who again placed it before the College of Physicians of that city in the presence of Cordus, with the view, that if that learned body had any changes in it to propose, these might be admitted, both with his knowledge and consent. After the book had undergone this ordeal, it was published by a decree of the College, and recommended to the use of the apothecaries. In the meantime, Valerius Cordus had returned to Italy, where, while he was diligently pursuing his studies, he was cut of by early death. He died at Rome on the 25th September 1544. The Pharmacopoeia, meanwhile, was published by authority of the Senate of Nuremberg, first in 1545, as already stated, afterwards at Venice in the year 1556, and at Antwerp, on the 1st of March one thousand five hundred and sixty-eight (1568). It was afterwards published in folio at Nuremberg in the year 1612, and in a small form with the Scholia of Peter Coudenberg and Matthew Lobelius in the year 1637.

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* Chronicle of John Stowe. Edited by Edmond Howes. London, 1632. Folio, p. 1028.

† Ricettario di Dottori dell' Arte e di Medicina del Collegio Florentino, all instituto dell Signori Consoli dell Universita delli Speciali. Firenza, 1448.

The Dispensatory of Valerius Cordus is compiled avowedly from the writings of Avicenna, Rhazes, Mesues, Nicolaus, Actuarius, Ætius, and other authors who had previously written on the same subject. The arrangement is the following; Confections, aromatic and opiate; Preserves; Conserves; Lenitive and laxative medicines; Pills of various kinds, mostly purgative; Syrups; Robs; Lohochs; Lozenges; Plasters; Ointments; Oils; and the preparation of certain simples.

It may have been and probably was a valuable performance, if we consider the time at which it was published, and that it was the first attempt to publish in Europe after the origin of the art of printing, a formulary of directions for the guidance of the apothecary and druggist. But if it be examined with the eye of common sense, it will scarcely be entitled to a high rank. The compound medicines consist, like the compounds of some of the ancients, of a great number of simples, several of which must be useless or must neutralise each other; and often they contain expensive articles, which can exercise no physiological action upon the animal body. The Electuary of Gems from Mesues contains twenty-four articles, among which are white pearls, sapphire, hyacinth, emerald, red coral, ivory shavings, silver leaf, and amber. The Diaxyloaloes of Mesues contains in like manner, twenty-five ingredients. The *Confectio Liberans*, namely, the Confection delivering from the plague, contains thirty ingredients, among which are, Armenian bole, *terra sigillata*, pearls, white coral, red coral, ivory shavings, ashes of burnt ivory, emerald, hyacinth, camphor, musk, and amber. This is said to possess great power against the plague. The Tryphera of Nicolaus, a medicine supposed capable of curing pain in the stomach, frensy, and melancholy in females, rheumatism and pneumonia, consists of nineteen ingredients;—opium, mandragora, and hyoscyamus being combined with cinnamon, cloves, ginger, and fennel. In the *Aurea Alexandrina* of Nicolaus are fifty-two ingredients, among which are boiled gold, silver leaf, pearls, bone of the stag's heart, and ivory shavings. He gives prescriptions for the Theriaca of Andromachus, which contains fifty ingredients, the Mithridate of Damocrates, which contains thirty-three ingredients, and one from Cleopater and Antipater, as transcribed by Galen and Aetius, containing forty-eight ingredients.

It is nevertheless not without interest to observe, that he has two different formulæ for pills against gout, and that both contain hermodactyls or meadow-saffron. The one are the *Pilulae de hermodactylis majores*, from Mesues; and the other the *Pilulae arthriticae* from Nicolaus. In the former of which it is said, *adversus podagram*, *et arthritin prosunt*,—the chief ingredients are hermodactyls, myrobalans, aloes, turbith, colocynth, sagapenum, castor, euphorbium, opopanax, rue seeds, parsley seeds, and saffron. The arthritic pills of Nicolaus contain besides hermodactyls, turbith, and aloes, cassia wood, spikenard, olives, ginger, mastich, fennel, anise, and rock salt. Mastich and aloes, which make so great a figure in the modern dinner pills, are common ingredients in many sorts of pills in the Dispensatory of Cordus. He has pills of *Lapis Lazuli*, and pills of Armenian bole, both of which are represented to be serviceable against melancholy disorders and persons supposed to labour under what the physicians of those days called burnt bile. *Pilulae sine quibus esse nolo* (p. 186) of Nicolaus, which may be rendered indispensable pills, are composed of aloes, five sorts of myrobalans, rhubarb, scammony, senna, mastich, wormwood, roses, violets, agaric, and dodder. These are said to purge choler, phlegm, and melancholy; to be effectual against cataracts and dimness of the eyes; preserving the sight, and to heal pain in the ears.

Many of these formulæ repeat so often the same ingredients, that it seems wonderful that, even at this early period, physicians and compounders did not discover that it was possible to employ one good formula instead of many containing the same substances, only arranged and combined in different modes.

In the ointments bear's grease is a frequent ingredient, and fowl's grease an occasional one. Hog's lard is mentioned in two ointments; the *Unguentum Citrinum* of Nicolaus, and the *U. Populeon* of the same authority. In the former ointment it is combined with goat's fat and hen's fat.[*]

The authoritative publication of the Dispensatory of Valerius Cordus, with all its defects and objections, satisfied physicians, and official persons generally, that it was most desirable to have standard guide books for regulating the preparation and composition of medicines upon general principles; and the appearance of the Nuremberg Pharmacopoeia was soon followed by others.

To the Ricettario of Florence reference has been already made. The edition of that work which we have seen, appeared at Venice in the year 1560, under the authority of the College of Physicians of Florence. The work, which is in the Italian language, consists of three parts. The first, after treating of the qualifications and duties of the good apothecary, is chiefly a history of the simple medicines derived from the vegetable kingdom. The second division of this part is devoted to the explanation of the most important processes and operations of the druggist. The third and concluding division relates to the method of preparing preserves and conserves, infusions, decoctions; robs, juleps, and syrups, loochs, antidotes, powders, pills, lozenges, oils, ointments and plasters.

The second part of the Ricettario contains the formulæ for the preparing and compounding of all the medicinal compositions then in use.[†]

The third part contains the rating of the weights and measures; and a list of *succedanea*, or medicines to be employed as substitutes or surrogates.

The *Antidotario* of Florence, written in Italian, was published in Latin language at Antwerp, from the Plantin Printing House, in the year 1561.[‡] The Antidotarium of Bologna was published at that city in the year 1615.[§] The *Antidotario Romano*, originally written in Italian, was published in Rome in 1639, with a Latin translation by Hippolito Ceccarelli, with explanations, and with the annotations of Pietro Castelli, a learned Roman physician. Though this work appeared in this form in 1639, it is manifestly not the first edition, which probably appeared in the previous century. At all events, as it is inscribed to Pope

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[*] Dispensatorium hoc est Pharmacorum Conficiendorum Ratio. Valerio Cordo authore. Appendix ex Scriptis Jacobi Sylvi. Nunc denuo omnia a quam plurimis mendis expurgata Venetiis, MDLVI. 12mo.

[†] Ricettario Utilissimo et molto necessario a tutti gli Spetiali, che vogliono preparar le Medicine regolatamente In Venetia 1560, 12mo, pp. 174.

[‡] Antidotarium sive de exacta componendorum miscendorumque medicamentorum ratione Libri Tres Omnibus Pharmacopoeiis longe utilissimi. Ex Graecorum, Arabum, et Recentiorum Medicorum Scriptis collecti. Nunc primum ex Italico Sermone Latini facti. Antverpiæ. MDLXI. 12mo.

[§] Antidotarium Bononiense, 4to. Bononiae, 1615.

Gregory the Thirteenth, who died in the year 1585, it is clear that it must have been published previous to that time. It is one of the best of the Pharmacopœias of these times, and contains many new formulæ from different sources. The author gives a discourse on the conditions and rules belonging to a good apothecary. The annotations of Castello show considerable acquaintance with natural history, botany, and the chemistry of the day, much knowledge of Medicine, and a considerable amount of sense and judgment.*

In the year 1564 appeared the *Pharmacopœia Augustana*, the Pharmacopœia of Augsburg. This, by adopting a more clear arrangement, and diminishing, in several of the formulæ, the number of ingredients, acquired considerable celebrity; and in the year 1646, the eighth edition appeared, with a *Mantissa Hermetica*, or collection of instructions for the preparation of chemical medicines, and a *Taxa*, or tarif of prices at which medicines were to be sold. In this pharmacopœia are many formulæ taken from the Nuremberg Dispensatory.

The circumstance that contributed most to improve this pharmacopœia was, that it was illustrated and amended by the notes and animadversions of John Zwelfer, a learned physician of Vienna. The work in this amended form first appeared at Vienna in the year 1651, under the name of PHARMACOPŒIA AUGUSTANA REFORMATA. In the original Augsbourg Pharmacopœia all the preparations and compositions had been arranged in twenty classes. Zwelfer made upon each of these classes some general observations, chemical, pharmacological, and physiological, which were calculated to be very serviceable both to physicians and apothecaries. He made also on each preparation remarks which show considerable shrewdness and reflection. In some instances the remarks are justly severe, especially upon articles and directions, which, though suited for the warm climate of the East and of Italy, became quite unsuited to the cold and uncertain climate of Germany. Of this his remarks on quince-juice and pomegranate-juice in the larger mint syrup of Mesues are an instance. When the *formulæ* for compound medicines consisted of many articles, as in the case of the preparations called *Theriaca* and *Mithridate*, he analysed the whole, distinguishing the individual medicines into classes according to their effects, real or attributed, and specifying the weight of each class. He pointed out with justice the absurdity and inutility of these much vaunted compositions, as well as that of the antidote, as it was named, of

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* Antidotario Romano Latino, et Volgare. Tradotto da Ippolito Ceccarelli. Li Regionamenti et Le Aggiunte dell elettione de Semplici, et Pratica delle Compositioni. Con le Annotazioni del Sign. Pietro Castelli Romano. E Trattati della Teriaca Romana et della Teriaca Egittia E Nuova Aggiunta di Molte Ricette publicate dal Collegi de Medici di Roma. In Roma MDCXXXIX. 4to, pp. 359.

Matthiolus, equally celebrated for the multiplicity of its ingredients (one hundred and twenty-eight in number) "If we had not," he says, "in the case of the pompous compositions of the *theriaca* and *mithridate* treated at sufficient length, and even to the displeasure of readers, of the unwonted combination both of simple and compound medicines, we could scarcely refrain from inveighing still more severely against the *antidote* of *Matthiolus*, which not merely equals the abovementioned compositions in the number of its ingredients, but exceeds them in many absurdities. But it is irksome to resume this unprofitable subject; and I refer to my observations already made upon the fore-mentioned antidotes, more especially as any one may see at first glance that this antidote abounds in errors." Many examples might be adduced of the freedom as well as the sense of his critical animadversions. Indeed it cannot be doubted that the observations of Zwelfer must have been of essential service in simplifying the pharmacy of the seventeenth century.

Zwelfer states in his prefatory address that he was occupied sixteen entire years in the labour of examining, correcting, and improving the formulæ of the Augsburg Pharmacopoeia. As this address bears date the first of May 1652, he must have commenced his labours in the year 1636.

While John Zwelfer was making trial of his powers in the illustration, rectification, and amendment of the original Augsburg Pharmacopoeia, he was induced by many circumstances to publish a new dispensatory of his own. This appeared under the name of *Pharmacopoeia Regia, seu Dispensatorium Novum Locupletatum et Absolutum*, at Vienna on the 16th of June in the year 1652, and again in 1666. In the introduction to this performance, he tells us that, as upon accurate examination he found the state of Medico-Pharmaceutical art to be inefficient, imperfect, superfluous, and inelegant, he acted on the principles of selection. He retained the good, rejected the bad, set aside useless and ludicrous articles; deficiencies he supplied; he suggested improvements, and confirmed by his own experience whatever was deserving in the labours of others. "This prerogative, further," he adds, "I claim within the limits of modesty, that I have been the first to animate with life the shapeless mass of the Dispensatory. And of this new Dispensatory, in which I have been desirous to place not a collection of words but remedies, I boldly affirm, that it is not compiled, borrowed, and scraped together from different quarters, and decorated with the writings and fragments of others, like the jackdaw in borrowed plumes, but elaborated by my own exertions as a new Galeno-Chymical treatise.*

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* Procemium ad Lectorem, p. 483. Edit. 1672.

Zwelfer makes nineteen classes of compound medicines. The work is certainly much improved upon the Augsburg Pharmacopœia, and contains a large amount of judicious criticism, sensible information, and such chemical knowledge as was then accessible. The formulæ for compound medicines were simplified; the number of the ingredients was greatly reduced; superfluities were retrenched; useless and inert substances were in general rejected; and all were attempted to be rendered more neat. In short, the Dispensatory of Zwelfer was a great advance in the right direction.

The first edition of the *Pharmacopœia Regia* or *Dispensatorium Novum*, appeared at Vienna in 1652, a second in June 1666, which is indeed subjoined to the annotated edition of the Augsburg Pharmacopœia. A folio edition of the *Pharmacopœia Regia* was published at Nuremberg in the year one thousand six hundred and seventy-five.*

The Nuremberg Pharmacopœia and the Augsburg Pharmacopœia for a long time divided the suffrages of the German physicians and apothecaries.

One good effect of the labours of Zwelfer appeared in an improved edition of the Nuremberg Pharmacopœia, which, after being subjected to the labour and examination of the college, was published in the year 1666, by the conjoined authority of the college and republic of Nuremberg. The fellows of the college state in their preface that they are aware, that many of the formulæ in the original Pharmacopœia of Valerius Cordus were antiquated and useless; these they discarded and substituted in their place others which they hope are more suited to modern taste. They allow that they have borrowed various hints from the researches of Zwelfer; and if, say they, any one is dissatisfied with the changes which they have introduced, they recommend him to have recourse to the lucubrations of Zwelfer; adding that they have no desire to think, that nothing is right but what they themselves have done.

It is remarkable, nevertheless, that this learned body did not perceive the folly and unprofitableness of such complicated preparations as the *Theriaca* and the *Mithridatium.* They give at the beginning of their work two formulae for the *Theriaca*, and two for the Mithridate or Confection of Damocrates.

In the improved Nuremberg Pharmacopœia all pharmaceutical preparations are arranged in three classes or general divisions; the first, that of medicines prepared without boiling, whether simple or compound; the second class, that of medicines, simple and compound, prepared by decoction; and the third, that of medicines prepared by distillation and chemical processes.

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* Pharmacopœia Regia, seu Dispensatorium Novum Locupletatum et Absolutum, annexa etiam Mantissa Spagyrica. Cui Accessere Bini Discursus Apologetici. Authore Joanne Zwelfer Palatino, M.D. Noribergae anno MDCLXXV. Folio, pp. 418 et pp. 267.

Each of these classes is then subdivided into sections.

The editors give a very full list of substances, both simple and prepared, which the apothecary and druggist should possess. These are arranged under the usual heads of the Vegetable, the Animal, the Mineral Kingdom, and articles furnished by or obtained from Marine Bodies. Though Germans, they were not aware or were not prepared to recognise the importance of the aereal or gaseous kingdoms, which it was reserved for a modern professor to do The list of animal substances is at once absurd and not a little loathsome. Dried toads, human skin, human skull, warts from the hoof or heel of the horse; the tooth, bowels, and liver of the wolf; mummy; the lung of the fox; the dung of the pigeon and peacock, that is guano; cob-web; and the penis of the bull form some of the principal articles. Fatty substances are taken from fowls, quadrupeds, and reptiles; and nothing is too small or too difficult to be obtained, which does not furnish fat for the uses of the apothecary. *

Many of the formulæ, doubtless, are the original ones of Cordus. A few, however, from other sources are introduced. To several of the formulæ in this and other Pharmacopœias may be traced some of those remedies and formulæ which were used in more recent times for the cure and alleviation of various formidable diseases. The *Pulvis Epilepticus Rubeus* contains what the editors call magistery of the human skull. The *Pulvis ad Strumam* or scrofula powder, contains burnt sponge, bone of cuttle fish, rock salt, sponge-stone, that is carbonate of lime, with galls, pepper, ginger, and cinnamon (p.44) We have noticed in the first Nuremberg Pharmacopœia the presence of meadow-saffron in gout pills. We have now to observe that the noted Portland Powder is found in this Pharmacopœia in the shape of *Pilulae Arthriticæ* or Gout pills. These are directed to be made from powder of *Teucrium chamæpitys, Teucrium chamædrys*, less centaury, Aristolochia, rhubarb, gentian, hypericon, human .skull, with chicory and red sanders wood, all to be incorporated with Cyprian turpentine.

The necessity of continuity in tracing the progressive advancement of pharmacological knowledge and pharmacopoeia literature has obliged us to advance much further in the course of the seventeenth century than chronological justice to other bodies would otherwise have warranted. A body which speedily followed the example of Nuremberg and Augsburg was the faculty and municipal government of Cologne; a town during the sixteenth century of great political consequence, both as an independent ecclesiastical bishoprick and as a great literary publishing station. The first Pharmacopœia of the city of Cologne appeared in the year 1565, one year after that of Augsburg. In the course of sixty years this publication underwent several corrections and received not a few improvements; and an edition of it, which appeared in the year 1627, is announced as containing many emendations, and serviceable additions.* It is nevertheless greatly charged with complicated and idle formulæ; and it is too manifest that the Cologne Pharmacopœia had appeared previous to the emendations of Zwelfer.

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* Dispensatorium Pharmacorum Omnium tam Galenicorum, quam Chymicorum quae hodie in usu potiore sunt. Authore primo Valerio Cordo. Nunc Vero Opera et Studio Collegii Medici Inclytae Respublicae et Norimbergenis, Emendatius et Selectis compositionibus auctius redditum et quarto publicatum. Norembergæ, Anno MDCLXVI.

As a contrast to this in some degree may be mentioned the *Pharmacopœia Brussellensis*, or Brussels Pharmacopœia. It is stated that the first edition of this work appeared in the year 1641. This was certainly not a very perfect performance. It was thirty years afterwards that the Brussels College published a Pharmacopœia, which they thought was entitled to the confidence of the Flemish physicians and apothecaries. This book, nevertheless, is too similar to those of that period in general to require us to dwell upon its contents. Numerous medicines, simple and compound, for healing all diseases and infirmities, formulæ consisting of multiplied ingredients, often very useless, great complication and little efficiency, seem to be the leading characters of the work. It contains like the Augsburg Pharmacopœia a taxed list or tariff of prices for medicines and medicinal compounds; a measure which could have no other effect than that of causing the apothecary to substitute bad for good medicines, and to practise adulteration in all the rare, valuable, and expensive preparations.†

Meanwhile the attention, which was every where given to the subject of pharmacy and the attempts to introduce uniform principles, had been of great service in making both physicians and apothecaries more fully and intimately acquainted with the subject. We have in our seventy-first volume endeavoured to explain the difference between Materia Medica and Pharmacy, and the relation which the latter bears to the former.‡ It is now necessary to notice the meaning of certain terms which came into use in the sixteenth and seventeenth centuries, in treating of medicines and medicinal compounds.

Medicines were ipstinguished at this time into two great orders;

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* Pharmacopœia sive Dispensatorium Coloniense. Jussu et Auctoritate S. P. Q. Agrippinensis Revisum et Auctorum labore Cl. et Exp. V. D. Petri Holtzemii, Com. Palatini. Coloniæ Agrippinæ, 1627. Folio pp. 102.

† Pharmacopœia Auctior et Correctior, jussu Nobilissimi Amplissimique Senatus Bruxellensis Edita, Opera et Studio Sex Collegii Medici Assessorum. Bruxellæ, 1671, Folio 237.

‡ Edinburgh Med. and Surg. Journal, Volume lxxi. April 1849, p. 485.

Galenical medicines, and Chemical, or, as they were occasionally denominated, Spagirical medicines. The former were those which consisted chiefly of such simple medicines and their combinations as were used by the ancient physicians; and as many of these were vegetable products, the term Galenical often corresponds, accidentally indeed, with medicines obtained from the vegetable world. The Arabians introduced a more complicated and elaborate mode of preparation, that by means of chemical processes; distillation, precipitation, elutriation, cupellation and similar methods. Hence all the medicines obtained in this manner and by chemical processes are designated by the names either Chemical or Spagirical. At the same time, it must be observed that all do not exactly understand chemical medicines in the same sense. Zwelfer classes under Spagirical or Chemical medicines the preparations of the metals; vitriol, sulphuric acid, sulphuric ether; sulphur and its preparations; nitre and substances prepared from it; and tartar, or the salts of potash. Under the head of chemical medicines, the Nuremberg Pharmacopœia of 1666 classes all the distilled waters, all the vinegars, the preserved vegetable liquid juices, the inspissated tinctures, spirit of nitre, spirit of salt, hartshorn, all the essential oils, and the metallic preparations. The Brussels Pharmacopœia makes a head of some Spagirical medicines only; and under this the editors place the different metallic preparations; vitriol in all its forms, including not only the sulphates of zinc, copper, and iron, but sulphuric acid and sulphuric ether; salts of various sorts; nitre; tartar; including various sorts of potash and tartar emetic; and the caustics, potash and nitrate of silver.

Next after the Nuremberg and Augsburg Pharmacopœias came that by the London College, first published in December, in the year one thousand six hundred and eighteen. The royal mandate issued at Whitehall by James the First of England is dated the 26th of April 1618.

The Pharmacopœia contains a list of the fellows of the college, thirty-four in number, of whom Henry Atkin was president; Sir Theodore Mayerne the eldest fellow; a table of weights and measures; a catalogue of simple medicines; an interpretation, or glossary of certain common terms; a list of distilled waters in ordinary use, and the usual formulæ for the preparation of compound medicines.

These are divided into AQUÆ COMPOSITÆ; Medicated Wines; Medicated Vinegars; Decoctions; the Simple and Compound Syrups; the Medicated Honeys and Oxymels; the Robs or Inspissated Juices; the Linctuses or Lohochs (*Eclegmata*); the Preserves, Conserves, and Confections; the Powders, which pass by the twofold name of *Species* and *Pulveres*; Electuaries; Pills;

Troches or Lozenges (*Trochisci*); Expressed Oils; Simple Oils by expression or decoction; Compound Oils, most of which are complicated mixtures of the essential and aromatic oils; Ointments, simple and compound; Plasters and Cerates; Chemical Oils, that is those obtained by distillation, including, however, such strange substances as the Oil of Bricks, Oil of Arsenic, Oil of Bay Salt, Oil of Amber, Oil of Sulphur, Oil of Vitriol; certain chemical preparations, as Oxide and Wine of Iron, Cream of Tartar, Flowers of Sulphur, Caustic Potash, Calomel, Sugar of Lead, Turbith Mineral, Glass of Antimony, and a few others heterogeneous in nature and in the methods of preparation.

Though several formulæ are adopted from the old authorities, Avicenna, Mesues, Haly, Nicolaus, Valerius Cordus, and the Augsburg Pharmacopœia, not a few are taken from Fernel, who by this time had become an authority something potential in the arrangement of formulæ, and the due admixture of compound medicines. Other authorities are Renodæus, Fabricius ab Aquapendente, Andreas Aurifaber (Orfebre or Goldsmith)? Andernach, Vigo, Peter Abano, and similar writers.

Among new and little known formulæ are the following. VALENTIA SCABIOSÆ JOANNIS ARDERNII *ex oppido Newark in Comitatu Nottingham; Chirurgi exercitatissimi; qui floruit, anno* 1370, *tempore Eduardi tertii Regis Angliæ; ipsissimis verbis ex antiquo manuscripto excerpta.* This ointment is formed from the juice of the scabiosa mixed up with hogs' lard.

TAPSI VALENTIA *ejusdem authoris.* An ointment from the juice of the *Thapsus barbatus* (*Verbascum thapsi*) mixed with lard.

TAPSIMEL *ejusdem*, an ointment made from the juice of celandine and thapsus, mixed with honey, burnt vitriol, burnt alum, and ink. This ointment is said by the author to be *nobile unguentum contra pruritum ani*, as also in other parts of the body.

The London college appears to have exerted themselves laudably in making a selection of good prescriptions from the most eligible sources. But they appear also to have collected and copied too slavishly. We find still the *Antidotus Magna Matthioli adversus venena et pestem*, consisting of its multiplied ingredients, the Mithridate of Damocrates, two formulæ for the Philonium, the *Theriaca* of Andromachus, the *Theriaca Londinensis*, the *Electuarium reginæ* of the Cologne Pharmacopœia, and many similar complicated and unprofitable prescriptions, of no other use apparently but to incur expense to the purchaser. For much of the complication and diffuseness of the formulæ, the London Pharmacopœia was indebted to Sir Theodore Mayerne, a great lover and practitioner of prolixity and complication in prescription.

The College seem further to have been perfectly willing to gratify the taste of the public by showing how to prepare palatable, though most pernicious liquors. They give formulæ for the preparation of Usquebach, *Aqua mirabilis*, and *Aqua rosa solis* or *rosis solis*, all strong spirituous compounds, highly flavoured with aromatics and essential oils, and which in those times were much used. They even go so far as to give a formula for distilling from beer and wine lees, a cheap spirit, which, with a few aniseseeds in it, is for the use of the poor, and sold every where. This is the Dutch anise-seed water. A more complicated and expensive stimulant for the special use, it is presumed, of wealthy dram-drinkers, is prepared from weak spirits of wine with anise-seed, fennel-seeds, caraway-seeds, cloves, cinnamon, and ginger.*

In the original Arabic Medicine Books of Mesues and Serapion, the Antidotaries of their European followers, and the first European dispensatories of Nuremberg and Augsburg, the practice was to give not merely formulæ for the preparation of the medicines and medicinal compounds, but to subjoin notices, more or less ample, of the infirmities, and diseases, and conditions of the human body, in which each medicine was to be administered. These Pharmacopœias, in short, were systems of Materia Medica, with information on the physiological properties, and therapeutic effects of the medicinal agents. This was carried to a length still greater by Zwelfer, who, both in the Reformed Augsburg Pharmacopœia, and in his *Pharmacopœia Regia*, or Dispensatory, introduced a great deal of matter, sometimes didactic, sometimes controversial, yet rarely void of interest, not only on the physiological properties and therapeutic effects of medicines, but on the chemistry of the combinations and formations.

In the London Pharmacopœia, as it first appeared in 1618, all this matter was discarded. It was a pharmacopœia, or record of formulæ and prescriptions, and nothing more. Since that time, Pharmacopœias have been regarded, with few exceptions, in most European countries as formularies ; the respective colleges leaving to the dispensatories to explain the reasons for the mode of combination, and to state the physiological properties and therapeutic effects and uses of the medicinal agents.

The third edition of this Pharmacopœia was published on the 19th October 1626.

After this period no edition of the work appears till the year one thousand six hundred and fifty, probably by reason of the unsettled state of public affairs. In the year 1650, that namely following the death of King Charles I., a new edition was published in folio, and a small reprint of the same in 1651.† This edition can scarcely be said to be any improvement upon that of

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* Pharmacopœia Londinensis in qua Medicamenta Antiqua et Nova usitatissima, sedulo collecta, accuratissime examinata, quotidiana experientia confirmata describuntur Diligenter revisa, denuo recusa. Emendatior, Auctior, Tertia Editio. Opera Medicorum Collegii Londinensis. London, 1627. Folio, pp 204.

† Pharmacopœia Londinensis Collegarum Hodie viventium studiis ac Symbolis ornatior. Londini, 1650, folio, pp. 212, et 1651, 12mo, pp.. 371.

1626. It contains the same long complicated prescriptions, the same amount and number of articles of doubtful properties, the same traces of slavish copying, the same superstitious veneration for antiquity, and the same want of judicious selection. It must be allowed, indeed, that all these errors and defects were very much the result of the state of medicine and chemistry at that time. Chemical knowledge was rude and barbarous, and not untinctured with superstition. The philosopher's stone and the universal medicine were still objects of research with some. Medicine, especially its practice, was encumbered with foolish and superstitious observances; and it must, doubtless, have required considerable energy indeed to shake off the authority of the old Arabian and philo-Arabian physicians. It is manifest that this energy was either not possessed by the physicians of the seventeenth century, or the time for its exertion was not yet arrived.

It would be tedious, without being either agreeable or profitable, to follow the progress of the College in this dark, confused, and little-cultivated path, during the latter half of the seventeenth and greater part of the eighteenth century. It is sufficient to say, that in 1653 appeared the harsh and censorious commentary of Nicolas Culpepper, a person who wanted every qualification for the duty of amending and improving the formulæ of the Pharmacopœia, except a considerable degree of self-esteem, or what might more justly be called conceit and assurance. The Pharmacopœia was sufficiently open to criticism, it may be to censure. But how was this to be judiciously and effectively administered by a person, who, besides much ignorance, was a believer and practitioner in judicial astrology. It would have required a person well-conversant in natural history and a good chemist to write a proper and instructive commentary; and to neither of these characters was Nicolas Culpepper entitled. If his annotations and comments are still occasionally read, it is chiefly to show the strange properties ascribed at that time to medicines, the odd fanciful doctrines taught in explaining their action, and the useless and unserviceable consequences which result from substituting for the observation of nature and the statement of facts, fancies, superstitious ideas, and imaginary conceits.*

New editions of the London Pharmacopœia appeared in 1662, 1667; and in 1691 appeared the New London Dispensatory, containing the Pharmacopœia translated by W. Salmon.

On the 2d September 1720, the sanction of the college was given to a new edition under the respectable presidency of Sir Hans Sloane, and while Mead and Freind were among the censors of the body. There is, nevertheless, little effected in the way of retrenchment of superfluity and restoration of simplicity in this edition. The noted standing compositions of the Theriac and Mithridate, occupy their wonted places; and along with them is placed another compound of the same stamp, the *Confectio Raleighana.* The only change of much moment is that the electuaries are distinguished into the alterative and purgative; and consequently this section appears less lengthened and less confused than in the early editions.*

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* Pharmacopœia Londinensis; or the London Dispensatory. Farther adorned by the studies and collections of the Fellows now living of the said College. By Nicholaus Culpepper, Gent., Student in Physic and Astrology, living in Spittle-Fields near London. London, 1653. Folio, p. 325.

Nearly the half of the eighteenth century was elapsed before the College began to think, that the Pharmacopœia contained many things which might be discarded, and was destitute of several which ought to be introduced. A committee of revision had been appointed, and in the year 1742 they presented an interim report on the actual state of the Pharmacopœia, with a draft containing sundry proposed changes, in publishing a new Pharmacopœia. This report is the first example of sound thinking applied to the business of preparing a Formulary. The reporters admit the superfluity of formulæ, the complication in their construction, the great numbers of useless medicines, the improper and unscientific preparation of others, the dangerous character of some of the antimonials, the fatal effects resulting from the irregular preparation and dispensation of cherry-laurel water, the luxuriant and redundant composition of the syrups and electuaries, the uselessness of many of the ointments and plasters, and various errors in nomenclature as well as irregularity in the denominations of weights and measures. They maintain that though the writings of physicians had become more rational and philosophical, yet all the Pharmacopœias in Europe, either from inattention or too great a reverence for preceding times, still remain encumbered with operose and incoherent compositions. Even the new forms, they remark, which have from time to time been introduced, prove often rather innovations than amendments, as they have usually been the invention of private persons, and transcribed into public pharmacopœias from the original receipts, without the examination requisite, before they should have been so solemnly authorised.

In 1745, the same Committee presented another report, which was to be final; and, upon its recommendation, the New Pharmacopæia was constructed. Much was done in the way of simplification, in retrenching superfluities, and lopping off what was redundant. All the Formulæ are shortened and improved. In short, a new era was evidently commenced in the preparation of Pharmacopœias. The whole class of loochs or linctuses was summarily discarded, certainly to the confusion and perplexity of the intellect, down to the present time, of all English students who visit and observe the practice of the Continental hospitals, in which these remedies are still retained. Matthew's pills were turned out without ceremony. The *emplastrum sticticum*, or German stich-plaster, not sticking-plaster, but wound-plaster, was also dismissed. Many ointments and plasters, in like manner, received a mittimus.

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* Pharmacopœia Collegii Regalis Medicorum Londinensis. Londini, MDCCXXI. Folio, pp. 154, et 1724. 12mo, pp. 176.

Several unnecessary, and not very wise articles, nevertheless, are retained. Besides the immovable Mithridates and Theriacs, there were viper-wine and viper-broth, *pulvis bezoardicus*, amber lozenges, and brick-oil, prepared by immersing heated bricks in oil, then breaking the bricks in fragments, and distilling the fragments in a retort. The *Confectio Raleighana*, simplified and curtailed, appears under the name of *Confectio Cardiaca*.*

In the next edition, which appeared in the year one thousand seven hundred and eighty-seven (1787), considerable changes took place. Chemistry was more studied, and the chemical constitution of various metallic and saline bodies was better understood. This tended both to simplify the formulæ and to remove some of the old names and substitute in their place those which were supposed to be more accordant with their composition. Hence great changes in nomenclature took place, and were mere harbingers of what was eventually to be attempted and accomplished in this way. To prevent these changes from causing inconvenience, a double index was given, presenting both the old and the new denominations. The college state that their chief object was to discard names chargeable with folly and unmeaningness, and to substitute others which might indicate in some manner the nature of the substance. Thus *Ethiops mineral* becomes *hydrargyrus cum sulphure; causticum antimoniale*, *vulgo* butter of antimony, becomes *antimonium muriaticum;* lunar caustic becomes *argentum nitratum; flores martiales* become *ferrum ammoniacale; mercurius dulcis sublimatus* becomes *calomelas; nitrum vitriolatum* becomes *kali vitriolatum; sal absinthii* and salt of tartar (subcarbonate of potash), becomes kali; Glauber's salt becomes *natron vitriolatum;* spirit of Glauber's nitre becomes *acidum nitrosum;* spirit of salt becomes *acidum muriaticum;* all the potash salts become *kalis*, with the appropriate acids, acetic, vitriolic, tartaric, and nitric; and in like manner of other articles.

The Pharmacopœia of 1787, however, was distinguished by changes and improvements much more important than those depending upon mere changes in nomenclature, though the latter, as implying more correct knowledge of the chemical constitution of the saline bodies, were to be respected as symbols and effects of advancement in science. The dawn was approaching in 1746, though the light was not yet sufficiently strong to dissipate many of the phantoms and monstrous productions which the long night of superstition, ignorance, and prejudice, had engendered. In 1787 came the morning light; and with that disappeared most of those strange preparations which had so long been suffered to stand in the Formulary. Not only are the mixtures, syrups, and electuaries, greatly diminished in number; but the Theriacs, Mithridates, and old complicated confections are no longer visible. There are only three electuaries—those of Cassia, Scammony and Senna. The long list of pills in the former editions is reduced to only six; two forms of laxative pill, the gum pills, mercurial pills, opium pills, and squill pills. The powders, also, forming a most exuberant department, stand at the number of eighteen of the most necessary compounds, which the physician has most occasion to employ. Lastly, the reader sees no oil of bricks (*oleum lateritium*), no Mosaic gold, no viper broth or viper wine, and no bezoar powder. Various new articles also were introduced, such as magnesia, the carbonate and calcined, the lemon and lemon juice, the Seville orange and a few more. The long list of distilled waters was advantageously shortened to eight in number. In short, the Pharmacopœia of 1787 must be regarded as denoting the commencement of a new era in Pharmacological literature; an era at which simplicity, sense, and experience, began to take the place of complication and confusion, fancy, presumption, and ignorance.*

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* Pharmacopoeia Londinensis. Londini, 1746.

A useful table was subjoined, stating the proportions of the fundamental drug in various powerful mixtures, so as to enable prescribers to regulate the dose with accuracy.

The London College continued to publish new and improved editions of their Pharmacopœia, as the progress of chemical, pharmaceutical, and medical science demanded; in 1809, in 1815, in 1824, and in 1836.

That of 1809 was remarkable for still greater changes in nomenclature, and a more decided approximation in its directions to the chemical and rational knowledge of the day.

This edition was criticised in the year 1811, with no small degree of asperity, by the late Richard Phillips, a man who, to accurate chemical knowledge, united a large amount of acuteness and sagacity. If Mr Phillips could have performed this duty without employing language and expressing opinions which too often were indications of a peculiar temper and a considerable facility of finding fault, in a spirit not always very becoming, his services would have lost none of their utility, and his purpose of amending the processes of the pharmacopœia would have been attained with equal facility.

The grounds on which Mr Phillips proceeded in pronouncing his judgment, were the following.

When instructions are given by a public body associating itself with the legislative and executive government of the country for conducting any processes of art in a particular manner, and in accordance with certain rules, these instructions ought to be perfectly correct and free from any considerable or manifest error. They ought also to be consistent with themselves; and their practicability and the possibility of carrying them into effect, both on the small scale and the large, ought to be previously examined with care, and ascertained. If directions of this kind are given by individuals or persons without authority, they have no other effect, than that they are set aside, and others more eligible are substituted in their place. When, however, the president and fellows of a College, with the authority of his majesty and privy council, publish a Pharmacopœia containing erroneous directions for the preparation of medicines, directions in which several articles are wasted, others cannot produce the articles expected in the proper form and purity; and when all this is enjoined to be done by the apothecaries of a whole kingdom, under the threat of the infliction of pains and penalties, if these directions are not obeyed, it becomes a duty to expose these errors, not only to warn the less expert against them, but to show how these errors may be avoided and corrections introduced, and to furnish reasons for the deviation from what is given forth with an authoritative tone.

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* Pharmacopœia Collegii Regalis Medicorum Londinensis. Londini, 1788, 4to, pp. 182.

This is not the place to examine the merits of the critical observations of Mr Phillips. It is sufficient to say, that all of them rested on good foundation, and that the amendments which he suggested, and which arose out of careful experiments, not unfrequently repeated, were most of them adopted in the subsequent edition of 1815. Mr Phillips found, that in most of the chemical formulæ the quantities of materials employed were incorrect, one or two being in larger amount than was necessary, sometimes leading to waste of articles employed, sometimes to imperfect and badly-prepared products. Such was the case as to the directions for the preparation of muriatic acid, nitric acid, in which the sulphuric acid was too large, and carbonate of ammonia, in which he found that the lime was in unnecessary excess. Upon the directions for preparing *liquor ammoniae*, Mr Phillips pronounces a censure equally just. And the instructions for the preparations of antimony are shown to be liable to objections equally strong. In short, the general result is that the Pharmacopœia of 1809 in all its chemical formulæ was incorrect, and very often gave impracticable directions,* and directions for processes which the Fellows of the College had not previously submitted to experiment. Mr Phillips further accuses the College, in no very equivocal language, of having borrowed from the Edinburgh and Dublin Pharmacopœias, without acknowledgement, every change that can be considered as an improvement. Mr Phillips, in short, arrived at the conclusion, that the Pharmacopœia of 1809 was so generally and irremediably erroneous that it required to be speedily and thoroughly revised. Presuming this to be necessary, and that the College would be sincerely desirous to substitute actual for conjectural emendations and improvements, Mr Phillips, who it seems had previously offered to assist the College, now repeated the offer of his services, if it appeared from the examination then submitted, that he was qualified to forward in any way the business of publishing a correct formulary for the use of the apothecary.

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* An Experimental Examination of the last edition of the Pharmacopœia Londinensis, with Remarks on Dr Powell's Translations and Annotations. By Richard Phillips. London, 1811. 8vo, p. 148.

It is not irrelevant to remark, that in the preparation of this Pharmacopœia, the College occupied two entire years; and that the President was Sir Lucas Pepys, Baronet, a physician who acquired a peculiar species of distinction in connection with the military expedition to Walcheren.

Meanwhile, the observations of Mr Phillips had shown the Society of Apothecaries the necessity of obtaining for their institution the services of an able practical chemist; and Mr Brande was placed over the chemical department of the Hall. The College of Physicians, however, neither followed the example set by the Apothecaries nor took the advice of Mr Phillips. The person who became chemical adviser to the College on the occasion of publishing the Pharmacopœia of 1815 was Mr Hume of Long Acre.

Whether this choice was judicious or not, whether it was justified by the necessities and position of the College, or by the merits of the individual selected, we need not give any opinion. If we believe Mr Phillips, the profession formed an opinion of their own. The result, indeed, might have been foreseen. The edition of 1815, which was called *Editio Altera* of 1809, though amended by the adoption, it is said, of several of the suggestions of Mr Phillips, as well as others, was still a most imperfect, and, if we believe Mr Phillips, a most erroneous guide in the chemical department. Here, however, we find that time and experience are the great teachers. Mr Phillips himself, in an examination of the Pharmacopœia, admits that he was wrong in several instances in his former remarks, especially in regard to muriatic acid and nitric acid. Tartarized antimony is still in 1816 a very troublesome substance to prepare, and becomes again the subject of lengthened criticism. At the same time, as Mr Phillips was always at pains to try the processes, and to discover why they gave results different from those expected, his observations always contained a large amount of useful information. His researches were distinguished by accuracy and patience,* and must be allowed to have greatly improved chemical pharmacy. Most of the errors as to the union of chemical substances Mr Phillips ascribes to the neglect of consulting the scale of chemical equivalents by Dr Wollaston.

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* Remarks on the Editio Altera of the Pharmacopœia Londinensis, and on Dr Powell's Translation and Annotations. By Richard Phillips. London, 1816, pp. 64.

These successive criticisms on the pharmacopœia and its translations by Dr Powell appear to have convinced the college that their author was a fit person to be consulted in preparing any subsequent editions of that work. It is not certain whether Mr Phillips was consulted or made a constant authority in the preparation of the edition of 1824. All that is certain is that he published the same year a translation of the work with notes and illustrations, containing full explanations of the chemical processes, and conveying a large amount of correct information. There was a slight deviation in arrangement. But on the whole the work furnished a tolerably just view of the actual state of chemical pharmacy at that time.* The introduction of diagrams to explain the actions taking place in double decomposition must have been highly useful to the student. The notes were further most useful in specifying the properties indicating the qualities of many medicines, and in describing the means which might be adopted for the detection of impurities, whether accidental or artificial. The utility of this knowledge was so apparent that the most important part of it was introduced into the next edition of the pharmacopœia, which appeared in 1836.

No information is given in this translation to what extent it had the authority of the College, though internal evidence shows that it was in truth the Pharmacopœia of the College. In the advertisement, however, to the last edition of 1836, Mr Phillips informs us, that, at the request of the Pharmacopœia Committee of the College, he either conducted or inspected the preparation of almost every medicine which had been introduced, and in many cases repeated the processes which the Pharmacopœia already contained. It is impossible to doubt that the services of so accurate a chemist must have been of great advantage in giving the formulæ and processes the necessary correctness.† Accordingly, the Pharmacopœia of 1836 is much more free than its predecessors from any of these serious chemical errors, which brought so much discredit on these two editions.

We know not whether the late Mr Phillips performed to the present edition of the London Pharmacopœia, during the course of its preparation, the same duties which he rendered to the last. Most likely his engagements, which latterly must have been onerous, prevented him from doing so. Nor does it appear that Mr Phillips had contemplated preparing an annotated translation, as formerly, of the present Pharmacopœia. Mr Phillips, at all events, departed this life in May 1851, and no translation by him was announced. Had life been prolonged to this active chemist, we have no doubt that any translation coming from him would have been received with great satisfaction by all branches of the profession, and with that confidence which his reputation justly inspired. Of the works that have been published since the appearance of the Pharmacopœia in February 1851, that of Dr Nevins we understand to be the substitute for the translation by Mr Phillips; and it consists not only of a translation, and notes on the uses and applications of medicines, but includes also the corresponding formulæ of the Dublin and Edinburgh Pharmacopœias, and thus forms a sort of complete system of *Materia Medica* and Pharmacy.

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* A Translation of the Pharmacopœia of the Royal College of Physicians of London. 1824. With Notes and Illustrations. By Richard Phillips, F. R. S. L. et E., &c., Lecturer on Chemistry to the London Institution, &c. London, 1824. 8vo. Pp. 326.

† A Translation of the Pharmacopœia of the Royal College of Physicians of London, 1836. With Notes and Illustrations. By Richard Phillips, F.R.S.L. et E., &c. By Permission. London, 1837. 8vo, pp. 392. Second edition, March 1837. 8vo, pp. 421.

The work of Mr Squire is well entitled to attention as presenting in like manner a comparative conspectus of the formulæ of each of the three Pharmacopœias, London, Dublin, and Edinburgh. It is, however, little more than a conspectus, though it gives short notes on the therapeutic uses of medicines. The performance of Mr Squire makes some approach to a National Pharmacopœia.

The foregoing sketch will suffice to show those progressive stages through which the Pharmacopœia of the London College has passed, from its first appearance in 1618 in the reign of James the First, to its recent advent in the year 1851, in the reign of Queen Victoria. It will communicate also some idea of the efforts that have been required, and those that have been made, during the last sixty-three years to keep it on a level with the advancement of chemical and pharmacological knowledge, and to make it perform its functions as a safe guide to the physician and apothecary. Of such a work it would be impossible in this place to present anything like a full account; much less is it possible to make a minute examination of the merits of all its chemical processes; since to do so in a becoming manner it would be requisite to write a commentary larger than the book itself. Such an undertaking must be left to the process of time, in which all things are examined and many things are proved. It is merely proper here to advert to some of the leading characteristics of the Pharmacopœia in relation to the present state of pharmacy.

First after the usual designation and distributions of weights and measures in the first part, comes the catalogue or list of the articles of the *Materia Medica* recognised by the College.

New Articles admitted in Pharmacopœia of 1851.	Articles of Pharmacopœia 1836 not admitted into Pharmacopœia of 1851.
Acidum aceticum pyroligneum.	Abietis resina.
Benzoicum.	Acetosella.
Citricum.	Acorus.
Gallicum.	Allium.

New Articles admitted in Pharmacopœia of 1851.	Articles of Pharmacopœia 1836 not admitted into Pharmacopœia of 1851.
Acidum Tannicum.	Asarum.
Tartaricum.	Aspidium.
Hydrochloricum.	Aurantium.
Nitricum.	
Aether sulphuricus.	
Ammoniae liquor.	
Ammoniae sesquicarbonas.	
Anethi oleum.	
Anisi oleum.	
Aqua destillata.	Aurantii flores.
Aurantii floris aqua.	Aurantii oleum.
Anthemidis oleum.	Baryta carbonas.
	Bergamii oleum.
	Bromium.
Buchu.	Diosma.
Calcii chloridum.	
Calx chlorinata.	Calcis hydras.
Carota.	Dauci fructus.
Carui oleum	
	Centaurium.
	Conii fructus.
	Contrajerva.
	Curcuma.
	Euphorbium.
Copaibae oleum.	Ferri percyanidum
Fœniculi oleum.	
Granati radix.	
Juniperi oleum.	
Lavandulae oleum.	Lacmus.
	Lactucarium.
	Lauri baccae et folia.
Limones.	Malva.
	Marmor.
	Marrubium.
Menthae peperitae oleum.	Mentha Pulegium.
Menthae viridis oleum.	Menyanthes.
Morphiae acetas.	
Morphiae hydrochloras.	
Morrhuae oleum.	
Olivae oleum	
	Opopanax.
	Origanum.

New Articles admitted in Pharmacopœia of 1851.	Articles of Pharmacopœia 1836 not admitted into Pharmacopœia of 1851.
Pimentæ oleum.	
Pix Burgundica	
Plumbi acetas.	Plumbi carbonas.
Potassæ bicarbonas	
Potassæ sulphas.	
Potassæ tartras.	
Potassæ iodidum.	
Potassii sulphuretum.	
Quinæ disulphas.	Quina.
Rosmarini oleum (Anglicum).	
	Rumex.
Rutæ oleum.	Ruta.
	Sabadilla.
Sabinæ oleum.	Sabina.
Silex contritus.	Simaruba.
Sodae bicarbonas.	Sodae acetas.
Sodae potassio-Tartras.	
Sodae sulphas.	
	Spigelia Marilandica.
	Stannum.
Strychnia.	
Sulphur praecipitatum.	
Thus.	
	Toxicodendrum.
Veratria.	Tussilago.
Viola.	
Zinci Sulphas.	

In these two columns are presented respectively the articles of the Materia Medica received into the Pharmacopœia of 1851, and those which were in the Pharmacopœia of 1836, and are now removed from the Materia Medica list of the publication of 1851. It must not be imagined, nevertheless, that all the articles on the first or left hand column are newly received articles, and that they were not in use or in the pharmacopœia previously. In some instances they stood in the pharmacopœia as articles to be prepared by the chemist and apothecary. Of this examples are seen in benzoic and citric acid, hydrochloric acid, nitric acid, diluted nitric acid, diluted hydrocyanic acid, diluted phosphoric acid, and tartaric acid, for the preparation of which formulæ were given in the Pharmacopœia of 1836. In like manner also were formulæ for the preparation of Aconitine, morphia, acetate, and hydrochlorate of morphia, Sulphate of quina, Strychnia, and Veratria, all of which, except the first, are in the present edition received into the list of the Materia Medica, as articles which are prepared on the great scale, it is presumed, with greater facility and in a more economical manner than can be done by the chemist or apothecary.

In consequence of the circumstances now mentioned, the first column cannot be presented as exhibiting an exact list of new articles only. Properly speaking, it presents those articles which the College think ought to be in the list of the Materia Medica, and which are usually to be obtained from manufacturing chemists.

The articles actually new are not very numerous. The principal of them are the following.

Acidum Gallicum.
Acidum Tannicum.
Atropia.
Copaibae oleum.
Galla.
Decoctum Gallae.
Morrhuæ oleum. Cod liver oil.
Panis; wheaten bread.
Silex contritus.
Thus.
Viola odorata.

Again, in this list of articles of the Materia Medica the reader should understand that while some articles are removed, the removal is rather a substitution of a new and more correct denomination, or the substitution of the article employed for that from which it is prepared, or the converse. Of this species of vicarious change or innovation, as it may be called, the following examples may be given.

Instead of Aloes spicata are substituted
Aloe Barbadensis.
Aloe hepatica.
Aloe Socotrina.
Sesquisulphuretum Antimonii becomes Tersulphuretum Antimonii.

For Argentum,	Argenti Nitras.
For Cinchona lancifolia,	Cinchona pallida.
Cydonia,	Cydonium.
Digitalis folia et semina.	Digitalis.

Lactucarium is discarded, while lactuca is retained.

Mentha Pulegium is expelled, while the Aqua Menthae Pulegii is retained

In the Pharmacopœia of 1836, this list was followed by a series of short descriptions of the physical and chemical characters of the most important articles, with such information as might enable the chemist and druggist to discover impurites and detect adulterations. These notices are now appended to each of the articles among the Materia Medica List, which are supposed to require them; while some are introduced in their proper place in the Formulary. In some instances these notices are more lengthened than those in the Formulary of 1836, in others they are abridged; in all they seem to be improved. Such at least is the conclusion at which we arrive, after perusing almost all of them, and comparing them with those of the former edition.

On the other hand, there are various articles in more or less general use in the treatment of diseases, which are not found in the foregoing list. This is mentioned not for the sake of pronouncing any censure. It is often more judicious to diminish than to enlarge the lists of the Materia Medica; and it is not always an indication of advancement to introduce new agents. The fact we merely mention. The following may be mentioned as articles which are employed by different individuals or sections of practitioners, which are not in the present edition of the London Pharmacopœia.

Phosphate of ammonia.	In gout and rheumatism.
Sulphate of manganese,	In gout.
Collodion.	In cutaneous diseases and excoriations.
Indigo.	In epilepsy.
Gelatine.	In cutaneous diseases, &c.
Glycerine.	In cutaneous diseases.
Chromate of lead.	In cutaneous diseases.
Fusel oil.	
Valerianate of soda. iron. zink.	As tonics, alteratives, and antichlorotics.

We come next to the Second Part of the Pharmacopœia, or the Formulary for the Prepared and Compounded Medicines.

1. Acids.—*Acidum aceticum*, it has been already noticed, is placed in the Materia Medica list, and therefore is not here. There is, however, an *Acidum aceticum dilutum*. It has been already noticed that the hydrochloric, nitric, and sulphuric acid, as well as the tartaric acid, are placed in the Materia Medica list. They are here in their dilute forms.

Aetherea.—A formula is introduced for the preparation of chloroform. We understand no physician or surgeon prepares his own chloroform, and all is manufactured, as it is called, by the manufacturing chemist. The reason, therefore, for the introduction of this formula must be that chloroform be prepared with purity, and of uniform strength. At the same time, it may be observed, that in the next edition this substance will, in all probability, be in the *Materia Medica* list.

Alkalina.—The translation now mentioned has not been the fate of the formula for *Aconitine*, which was in the last Pharmacopœia. The substance is not in the *Materia Medica* list of the present edition, and the formula for its preparation has been removed. Aconitine is therefore no longer sanctioned by the college. The formulæ for the preparation of *Strychnia* and *Veratria*, which were in the last edition, have been removed on a different ground. Both these articles are placed in the *Materia Medica* list. Conversely, there is a formula for the formation of the sulphate of Atropia; seven scruples and a half, or a sufficient quantity, to be dissolved in half a fluid ounce of distilled water and two fluid drachms of dilute sulphuric acid. This preparation is believed to contain the active principle of Belladonna.

Aquae Destillatae.—The distilled waters are the same, excepting that fennel water is removed. The plant and the oil, it will be remembered, are in the *Materia Medica* list.

Cataplasmata.—The charcoal poultice and the poultice of chlorinated soda, are introduced. Regarding the mustard cataplasm, or common sinapism, the boiled vinegar, or vinegar heated, is removed, while the linseed is retained. A more economical plan is to use only the mustard flour with vinegar, which makes an efficient sinapism at a rate not more expensive.

Confectiones.—No material change.

Decocta.—Decoction of galls, decoction of pomegranate root, decoction of logwood, decoction of Pareira, decoction of taraxacum are introduced. Decoction of Malvae and decoction of *Veratrum* are expelled.

Emplastra.—Plaster of cummin, plaster of iron and lead, plaster of iodide of potassium, are introduced. The plaster of iodide of potassium consists of one ounce of the salt mingled with six ounces of prepared frankincense (*thus*) six drachms of water, and two fluid drachms of olive oil, previously melted.

Enemata.—The enema of assafœtida introduced.

Extracta.—On these preparations we have only to say that all of them are bad as preparations to be preserved for any length of time. They become mouldy, and often undergo decomposition. One of the best is the extract of *Nux vomica*, which is made by macerating in spirit for seven days, and after expression and straining, subjecting the matter to a second maceration in spirit for three days. This preparation often keeps well, and contains the virtues, if virtues they can be called, of the *Nux Vomica*. This extract is newly introduced; and it cannot be denied that it is an effective addition to the Materia Medica. Whether it is to be a serviceable one or not, must depend very much upon the hands into which a preparation so energetic may fall. It is, however, greatly preferable to strychnia, as it is more manageable, and much less likely to do mischief in the hands of reckless and careless practitioners.

It is an instance of the unsettled and fluctuating state of medical opinion on Materia Medica and Therapeutics, that while the Extract of *Nux Vomica* is discarded from the last edition of the Dublin Pharmacopœia, in which it long had held a place, it is received into the present work of the London College.

Extract of digitalis is discarded.

INFUSA.—The infusion of *diosma* appears under the more familiar name of infusion of buchu.

An inspissated infusion of yellow bark (*infusum cinchonæ spissatum*), and a similar infusion of pale bark (*infusum cinchonæ pallidae spissatum*), are introduced.

The infusion of broom, *infusum Scopariae*, and the infusion of Simaruba, are discarded.

LINIMENTA.—The *Linimentum camphorae compositum* is directed to be made with oil of lavender, dissolved in rectified spirit, instead of spirit of lavender. This can scarcely be called a change. But this and similar preparations appear to have rendered necessary the introduction of the oil of lavender into the Materia Medica list.

MELLITA.—No change.

METALLICA.—It is not our intention to enter into the chemical merits of this extensive and important department. That would require a professed chemist in his laboratory with all his apparatus. Nor is it requisite. The most important, if not the whole of these articles are prepared on a scale more or less extensive by the manufacturing chemist; and from him they are procured by apothecaries, trading chemists, and druggists. No apothecary or druggist, we believe, manufactures his own tartrate of antimony, calomel, corrosive sublimate, or lunar caustic. It is unnecessary, therefore, to inquire minutely into the merits of the directions given by the College for the preparation of this order of articles.

ARGENTUM; SILVER.—All the preparations of silver are rejected from the formulary, we suppose, for the reasons now assigned. One only is given in an appendix, where it is recommended to be kept in readiness as a test; recently prepared solution of nitrate of silver. We cannot refrain from thinking, nevertheless, that the oxyde of silver, which has been found a useful preparation, and which has received a place in the Dublin Pharmacopœia, might have been admitted also into the London Formulary.

ARSENIC.—Of this metal the formula for a new preparation is given; the *Liquor Arsenici Chloridi.* This is prepared by dissolving half a drachm of arsenious acid with one fluid drachm and a half of hydrochloric acid in one ounce of distilled water, boiling and straining; and then adding water to make the whole to one pint. There is no table of proportions in given quantities in the work. But Dr Birkbeck Nevins comes to aid the prescriber, and informs him, that each fluid ounce contains one grain and a half of arsenious acid ($\frac{30}{20}=1\frac{1}{2}$), and that the dose is from twenty to thirty minims.

It is proper to mention that, under the head of the subsequent preparation, the reader will find in the work of Dr Nevins an elaborate and correct account of the best modes of ascertaining the presence of this poison in mixed fluids, of the fallacies to which the tests are liable, of the methods of obviating them, and of the cautions which require to be employed in administering arsenical preparations for the cure of disease.

The preparations from chloride of barium and its solution are discarded.

Of the preparations of calcium one only is left, namely, lime water. Chloride of *calcium* and *Calx chlorinata* are placed with lime in the Materia Medica list. For *Creta præparata* of the former Formulary, there is no place.

COPPER.—Sulphate of copper is directed to be prepared in the Formulary. The object is evidently to ensure purity.

IRON.—The iodide of iron, which stood in the Formulary of 1836, is removed; and in its place is substituted the syrup of iodide of iron.

The *Ferri carbonas cum saccharo,* or saccharine carbonate of iron, is introduced. This preparation, our readers are aware, has been long in the Edinburgh Pharmacopœia. The directions given in the London formula, Dr Birkbeck Nevins thinks to be less eligible than those recommended by the Edinburgh and Dublin ones. The water should be expressed from the mass as rapidly as possible.

This preparation is now much used as a chalybeate; and it is one of the most serviceable and most endurable forms of iron medicine. The dose, nevertheless, should be smaller than that usually specified, if it be intended that the medicine shall be easily taken and continued any length of time.

The *Ferri ammonio-citras* is also newly introduced. It may be proper to remind our readers that, several years ago, great attempts were made by some of our Irish friends, to introduce into practice the citrate of iron in solution, as a pleasant form for administering the mineral. The medicine was put up in bottles under the name of *Aqua chalybeata,* so strongly charged with carbonic acid gas, that the corks required to be secured by wires, and when they were opened the liquor sparkled and effervesced like champagne. The formula for the preparation of this agreeable chalybeate has not been made public. It is said to be at present very generally employed, and is found to be effectual as a chalybeate medicine.

Meanwhile the ammonio-citrate, though perhaps not quite so palatable, may make an approach to the Irish iron champagne.

The *Ferri sulphas* is directed to be prepared in a different manner from that which was employed in the former Pharmacopœia. Commercial sulphate of iron (four pounds) is directed, with one ounce of iron, to be dissolved in four pints of distilled water, containing one fluid ounce of sulphuric acid. Heat is applied, the mixture is moved until solution is completed. The liquor is strained while warm, and then set aside until crystals are formed. The crystals are eventually dried.

The object of this change appears to be to insure purity and freedom from other metals.

For the formation of the *Ferri potassio-tartras* a formula slightly different is given.

In the former method the sesquioxyde of iron was dissolved in hydrochloric acid. To this the potash liquor was added, and the mass was then boiled with bitartrate of potash. Then sesquicarbonate of ammonia was added until the solution was no longer acid. According to the present formula sulphate of iron (four ounces), is dissolved in sulphuric acid, (half a fluid ounce), and nitric acid (one fluid ounce). This is expected to form the sesquioxide of iron, which is then to be precipitated by the addition of ammonia. The sesquioxide is to be washed and set aside for twenty-four hours. Then the bitartrate of potash is to be heated to the degree of 140° in half a pint of distilled water; and to it in this state the mixt sesquioxide is to be added gradually.

MERCURY.—The oxyde and bromide of 1836 are discarded. The bicyanide and biniodide of mercury are also removed. Other articles are the same.

LEAD.—The formula for acetate of lead in the former edition is removed; and this metallic salt, which is always manufactured by the manufacturing chemist, is placed in the Materia Medica list.

The formula for preparing the *Plumbi Chloridum*, and that for the *Plumbi oxydum hydratum*, are both removed. In short, under the head of lead are only three formulæ; that for the solution of diacetate of lead, dilute solution of acetate of lead, and iodide of lead.

POTASSIUM.—The bicarbonate of potash, the effervescing liquor of potash, the sulphate, bisulphate, and tartrate of potash, are all removed from the formulary; the first and third being now placed among the articles of the Materia Medica. The bromide of potassium is entirely removed, having no place in the work. The iodide of potassium and the sulphuret of potash are placed in the

Materia Medica catalogue. The formula for compound solution of iodide of potassium remains as before.

Sodium.—*Liquor sodae,* a formula for the preparation of strong or caustic solution of soda, analogous to that of potash, directs thirty-one ounces of the carbonate of soda to be mixed with nine ounces of quick lime, and a gallon of boiling distilled water to be added. The rest of the process is the same as that for preparing *liquor potassae.* The density of this solution should be 1·061. In one hundred grains of the liquor are contained four grains of soda.

The medical uses and applications of this preparation are altogether similar to those of *liquor potassae* and the bicarbonate of soda. It is much more powerful as an antacid than the latter, and consequently a smaller amount of it will effect the object of saturating acidity, wherever that object is kept in view. Conversely, the pure alkalis are less easily borne either by the stomach or by the system at large, than the carbonates; and therefore their use cannot be continued so long. In giving this preparation for any length of time, the observations of Dr Prout on the use of soda should not be forgotten; and it will do neither practitioner nor patient any harm to be aware, that it is possible, by means of the pure alkalis, to do injury in certain diseases, either by saturating and neutralizing normal acids, or by impairing certain of the living processes. At the same time, if all that is said of the sanative and therapeutic properties of the Vichy waters be well-founded, here is an agent which, in small compass, ought to accomplish the same purposes.

The formulae for the preparation of the sesquicarbonate of soda, the sulphate of soda, (Glauber's salts), the potassio-tartrate of soda (Rochelle salts), and soda water, are removed, all of these articles except the last being placed in the Materia Medica catalogue. The last is prepared and sold everywhere.

Zink.—A formula is given for the preparation of the chloride, which has been now long in use as an escharotic, and of which the consumption must be considerable in preparing Sir William Burnett's disinfecting liquor.

Calamine and the sulphate of zinc are both in the Materia Medica list, and therefore withdrawn from the Formulary.

Tin.—This metal no longer holds its place either as an article in the Materia Medica of the College or in the Formulary. The protochloride alone is admitted in the appendix, not as a medicine, but for its application as a chemical test.

This important division of the chemical medicines of the Pharmacopœia is on the whole as complete and as correct as can reasonably be expected in the present state of practical medicine and the present condition of the chemical arts. We see no gold, or any of its highly praised salts, as in the foreign pharmacopœias.

But the metals and metallic salts, which retain their position, are those which experience has shown to possess in good hands valuable properties. Neither in the present state of the chemical arts, when so many articles are prepared with economy and of great purity by manufacturing chemists, would it be reasonable to object, that so many articles are placed in the Materia Medica list, and that for so few are formulae given. We believe that the time is approaching when these formulae may be removed from the Pharmacopœia, and retain their place only in the chemist's Manual, which probably is their proper position. The physician and apothecary may understand the mode of preparing these articles and the principles of their preparation. But as the physician never has prepared them, as even the trading chemist and druggist do not prepare them, and as the apothecary regards himself now as a medical practitioner, and never enters the laboratory, regulates the temperature of the furnace or sand bath, or performs an elutriation, it is at most a work of supererogation for Colleges to issue directions which are not certain to be followed, and which are certain to be disregarded, if the operators see it to be their interest to do so. The revolution here predicted is fast approaching, and, though only in progress, will no doubt advance to completion.

MISTURÆ.—Of twelve formulæ, three are discarded; the *Mistura assafœtidæ*, *M. Cascarillæ composita*, and the *M. Moschi.* The last must at all times have been in this country one the purity of which it was difficult to ensure. Supposing it were pure, what, it may be asked, are its uses and advantages?

With great deference to the Fellows of the College, we submit whether it is necessary or prudent to have such a formula as that for the *Mistura Spiritus Vini Gallici*, a species of that agreeable but dangerous compound called brandy egg-flip. If such a mixture be required for the stomachs, as it is supposed, of old and habitual wine and spirit-drinkers, can it not be easily prepared extemporaneously by any one. To compound such a mixture an apothecary is not requisite.

OLEA STILLATITIA.—For these distilled oils there is no place, all of them having been transferred with the *oleum terebinthinæ* to the Materia Medica Catalogue. The *oleum succini*, oil of amber, is entirely removed.

PILULÆ; PILLS.—A formula for the *pilulæ aloes cum sapone* and one for the compound colocynth pill is introduced. The latter, however, it must be allowed, is not so much an introduction as a substitution under another name. These pills have stood from the most remote times in all Pharmacopœias, sometimes under one denomination, sometimes under another. In almost all the other Pharmacopœias both of the Continent and this country they stood under the name of *pilulæ Cocciæ*, a term the original source of which has preplexed etymological inquirers. In the Pharmacopœia for 1746, the formula was rectified, the name was discarded, and the pills were denominated *pilulæ ex colocynthide cum aloe.* In that for 1787 the formula for the pills was removed; but the compound was retained among the extracts, under the well-known name of *Extractum Colocynthidis compositum.* This was continued in the formularies of 1809, 1815, 1824, and 1836. In the Pharmacopœia of 1851, the compound extract of colocynth is removed from the extracts; but the preparation appears among the pills as the compound colocynth pill. In this circumstance the London College have seen reason to approach to the Edinburgh and Dublin Colleges. The only difference between the preparation of 1836 and that of 1851 is that the latter is made with soft soap, to preserve, we understand, the pills in the necessary consistence.

The pills of iodide of mercury and the compound pills of Sagapenum of 1836 are discarded.

PULVERES;—POWDERS.—No change.

SPIRITUS.—SPIRITS and SPIRITUOUS SOLUTIONS OF ESSENTIAL AND AROMATIC OILS. Alkohol is removed to the Materia Medica list under the name of *spiritus rectificatus. Spiritus ammoniæ* is discarded, or supposed to be sufficiently represented by the aromatic form of this spirit, which is retained. Spirit of lavender is also removed; it is represented in the Materia Medica list by *lavendulae oleum.* In the others no change is made.

SULPHUREUM.—Under this is given a formula for the formation of the iodide of sulphur. One ounce of sulphur is directed to be placed in a glass vessel; and upon this are placed four ounces of iodine. The glass vessel is to be kept immersed in boiling water until the two substances are incorporated. When the whole has cooled, the vessel is to be broken, the mass is to be broken in pieces, and preserved in a vessel well secured.

SYRUPI;—SYRUPS.—Two new formulæ are introduced; one for *syrupus cocci,* syrup of cochineal; the other for *syrupus violæ,* syrup of violets. The syrup of cochineal, it may be observed, is of no use except as a colouring agent.

Apparently the College have seen the propriety of preparing this class of articles with the addition of rectified spirits; for in all of the formulæ of the present Pharmacopœia, directions are given to employ a small quantity of this agent. No spirit was employed in preparing syrups, according to the last Pharmacopœia.

TINCTURAE;—TINCTURES.—Several new tinctures are introduced. The tincture of camphor and the tincture of cardamom are both discarded; these articles being sufficiently represented, it is supposed, by the *tinctura camphoræ composita,* and the *tinctura cardamomi composita.* At the same time it is to be observed that the compound tincture of camphor, English paregoric, is almost exclusively for internal use as an agreeable sedative and anodyne for coughs; while tincture of camphor has been chiefly employed externally. We believe it is possible either to do without it, or have it dissolved when required by the usual means.

The formulæ introduced are the following.

Tinctura aconiti.	Tincture of monkshood.
Tincturæ cinchonae pallidae.	Tincture of pale bark.
Tinctura belladonnae.	Tincture of deadly nightshade.
Tinctura ergotae.	Aethereal tincture of spurred rye.
Tinctura limonum.	Tincture of lemon pill.
Tinctura lobeliae.	Tincture of Indian tobacco.
Tinctura lobeliae aetherea.	Ethereal tincture of Indian tobacco.
Tinctura quinae composita.	Compound tincture of quinine.

A change is made in the formula for *tinctura ammoniæ composita.* In the old formula this tincture contained oil of amber four minims, in somewhat more than one pint of solvent. These four minims of oil of amber are discarded. They could have been of little use either for good or evil, except to homœopathic practitioners.

As vehicles for substances which operate in small doses, as aconite, foxglove, conium, meadow-saffron, opium, spirits are perhaps a convenient agent. But it appears difficult to understand, what advantage or benefit can accrue from giving such medicines as bark, gentian, rhubarb, and senna in the form of tincture, when it is well known that about one or two ounces of the tincture must be taken at each time, in order to take a suitable quantity of the medicine. One ounce of such tincture is a medicated dram, and two ounces make a glass of spirits; and when such quantities of spirit are taken, whether it is likely that they can cure any disease is very doubtful, while it is certain that they can induce, and do induce, not a few serious and incurable maladies. How long will it be before physicians and Colleges will have the courage to speak the truth?

On the Wines and the Ointments we have nothing to say.

We have thus examined in such a manner, and at such length as the limits of these pages and the nature of this Journal will admit, the New Pharmacopœia for 1851 by the London College. We feel that a work coming from such a body is one neither for praise nor censure. Whoever offers commendation should consider well what his praise is worth, and to whom he offers it. It may be that the favour is conferred upon the individual offering, not upon the body receiving. This is a position in which no prudent person willingly places himself. Whoever censures should consider not only what he is censuring, but whether he or any other person could have done the same duty so well. The points blamed may involve mere differences of opinion, and for these no one ought to pronounce a strong judgment.

A reason not less conclusive against any decided opinion is the fact, that the merits and demerits of such a work cannot be ascertained except after lengthened trial. Two or three years must elapse before the inconveniences, if such exist, can be discovered. Our duty is finished when we have shown wherein the Pharmacopœia is calculated to facilitate the business of preparing and dispensing medicines.

In the Appendix is given a list of articles which are to be employed as tests in ascertaining the purity of various substances and compounds given in the *Materia Medica* list and the Formulary. These are the following:

Hydro-sulphuric acid, *recently prepared.*
Oxalate of ammonia *in crystals.*
Nitrate of silver *in crystals.*
Silver.
Gold.
Chloride of Barium *in crystals.*
Copper.

Turmeric.
Isinglass,
Lacmus tinctorius.

Solution of nitrate of silver, *recently prepared*, consisting of one drachm of the crystalline nitrate in one fluid ounce of distilled water.

Solution of Chloride of Barium, consisting of one drachm of chloride in one fluid ounce of distilled water.

Chlorine liquor, recently prepared, consisting of

One fluid ounce of hydrochloric acid, two drachms of binoxide of manganese in powder, half a gallon of distilled water.

The acid and binoxide to be mixed in a retort. The chlorine to be then conveyed into water in the usual manner.

Solution of sulphate of indigo.
Bichloride of platinum.
Iodo-cyanide of potassium and mercury.
Protochloride of tin.

It has been already stated that there are used in practice with various persons certain articles and preparations which are not contained in the Pharmacopœia. These are not numerous. Some which are not in the London Pharmacopœia are in the Dublin or Edinburgh work; and some are in neither. Those which are in either of the two formularies now mentioned are introduced both in the work of Dr Birkbeck Nevins and in that of Mr Squire, whose appendix contains the account of several articles not previously mentioned. Those which are in neither editions are given in two appendices to the useful volume of Dr Hunter Lane.

Of some of these articles, as the valerianates, a slight notice was taken in our seventy-fifth volume, when speaking of the Dublin Pharmacopœia.

Before quitting this subject we think it requisite to observe, that experience has satisfied us, that it would be expedient and a great convenience, to insert in the Materia Medica Catalogue all articles newly introduced, whether as articles under this head or as standing only in the Formulary. We are aware that this is contrary to the practice of the College, who have hitherto admitted into the Materia Medica Catalogue only those articles which are called simples, or which are understood to be procured by the apothecary and druggist from the wholesale dealer and the manufacturing chemist. On the other hand, were all articles admitted into the Materia Medica Catalogue, it would show the reader at once the extent of that list, and would communicate to him a clear and distinct idea of the implements and agents with which he was to work. Thus chloroform would find a place in this list as well as in the formulary; and by the same means it would be learned that chloride of zinc and its solution were now recognized as articles in the Materia Medica.

On the other works we have little to add to what has been already said. The treatise of Dr Birkbeck Nevins is the most ample, the most complete, and we should think, upon the whole, the most serviceable. It is the book for the table of the consulting room, the surgery, and laboratory; and shops cannot do without it.

It is just also to Dr Nevins to say that, in estimating the therapeutic efficacy of various new remedies, he has endeavoured to avoid excessive credulousness in the statements of professed advocates of remedies, and that degree of distrust which sometimes proceeds to scepticism. This work is in this respect a good example of sober and temperate judgment.

The work of Mr Squire is very excellent, and contains many things desirable to be known. With the work of Dr Nevins it will probably divide the possession of the table of the surgery and laboratory.

The other two works are suited for different purposes. They are portable, and are evidently intended to be carried about either in the pocket or in the carriage. The work of Dr Hunter Lane is the most complete, and is unquestionably entitled to the preference between thè two. This book indeed presents many advantages to recommend it well to the practitioner. It is small and portable. Its arrangement is alphabetical, and therefore it is convenient for immediate reference; as the whole book is an index, the preliminary labour of consulting the index is obviated. The information is given in a very condensed shape, yet it is in general sufficient for the guidance of the consultant. Further, in two appendices are given short notices of all the medicines which, though not admitted into the English Formularies, are more or less generally employed in France, the United States, and the East Indies; and last comes a short but useful view of Toxicology. Creditable to the diligence of the author, it will be serviceable to the student.

ART. II.—*Corpulence; or Excess of Fat in the Human Body: its relations to Chemistry and Physiology, its bearings on other Diseases, and the Value of Human Life, and its Indications of Treatment. With an Appendix on Emaciation.* By THOMAS KING CHAMBERS, D.M., Fellow of the Royal College of Physicians, and Gulstonian Lecturer for 1850. London, 1850. 12mo, pp. 166.

Dr Chambers entertains the opinion that most persons attach to the circumstance of considerable or extreme corpulence and obesity the idea of something ludicrous; and that in consequence of this association the subject has either been treated with positive levity, or without that degree of gravity and seriousness which it truly deserves. This charge he brings not only against Mr William Wadd, the author of one of the best productions on the subject in the English language, but also against most or all of those persons who have described cases in the Philosophical Transactions, and who in so doing, have recorded such facts as the breaking of horses' backs, the breaking down of walls to allow the exodus of their corpses, and the great number of bearers who were employed to convey these large persons to their final resting places.

It would be difficult to deny, that excessive obesity has been the subject of not a few jests, some good and some indifferent enough. The fat knight, Sir John Falstaff, unquestionably afforded subject for not a few coarse jests to the true Prince and his companions, as well as to the knight himself. It is also true that the fat knight was, as he remarks himself, not only witty but the cause of wit in other men. But it requires little penetration to discover that this was in no way connected with his corpulence. Then the Spectator's Club, to whom no one was admitted who was capable of passing through the common sized folding doors, must also be allowed to be a piece of humour intelligible enough. But beyond these we cannot say, that we can at present call to remembrance any instances in which to the observant mind anything remarkably cheerful or laughable is suggested. Of Vitellius we know only that he was a fat, sensual, overgrown, swinish glutton, whose end was sufficiently mournful. Charles the Gross, we know only by that soubriquet; and his life suggests nothing very amusing. Henry Tudor, who rejoices in the name of Eighth, was a cruel, capricious, and sanguinary tyrant, selfish, like all sensualists, to an excessive degree, the slave of the most degrading appetites and passions; and though Hume has tried to make us laugh at some of his absurdities, well may we say, Heaven defend us from such laughter. Even the anecdotes related in the Philosophical Transactions, we have always regarded rather as proofs adduced by the authors to illustrate as forcibly as they could, the great bulk and weight attained by these corpulent persons, than as tending to excite a single laughable or merry conceit. It is very true that in these accounts now referred to, we desiderate that full information upon the habits of the individuals and the causes of their death which would have been desirable. But in almost all these instances the weight of the individuals is stated; and that certainly is one means of forming an idea of the degree in which they had exceeded the average amount of corpulence. Dr Chambers informs us that, as he sees no reason for making such an infirmity or its concomitants a subject of levity, and cannot understand how that which shortens the duration of life can be considered of trifling importance, he is, without being deterred by these circumstances, to make Corpulence or Obesity a matter of serious attention.

CORPULENCE, under the name *Polysarcia* and *Polysarcia adiposa*, was defined in 1763 by Sauvages as "that disease which deforms the shape of the person, and impairs the agility of the movements by an excessive mass of fat;" and by his placing it under the Tenth Class, or that of Cachectic Diseases,* it is manifest that he considered it as an infirmity, in which the fluids and the solids are more or less in a morbid condition. In his general remarks on this class he maintains that Digestion and Assimilation are disordered, and that hence the *Crasis* or constitution of the blood is depraved.

At a period considerably posterior, namely in 1821, corpulence is by Joseph Frank defined under the name of *Polypionia* as "an abnormal collection of fat, principally in the cellular texture of the skin and the interstices of the subjacent muscles, impeding the motion and other functions of the body."†

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* Nosologia Methodica, Tomus Secundus, Classis x. 5 Tome 8vo. Amsteldami; 1763, and 4to, 1768.

† Praxeos Medicinæ Universæ Præcepta. Auctore Josepho Frank. Partis Primæ Volumen Tertium Editio Secunda. Taurini, 1821. Caput xl., p. 288. 8vo.

Dr Chambers thinks that obesity must be viewed as a true hypertrophy of the adipose tissue, or increased growth without change in chemical or anatomical characters. This condition he thinks necessary to distinguish the disorder from those conditions of certain organs, as the muscles, the liver, the kidneys, which are known as fatty degenerations. The two conditions, he argues, are opposite, and may be contrasted with each other. In the fatty degenerations, so entirely different is the change, that the substance of some necessary part of the body is removed, and in its place is substituted a material quite foreign. But in Obesity the tissues of all the members remain intact, possess all the parts requisite to execute their offices, and are only impeded in the performance of them, when the additional superimposed matter alters the shape so far as to offer a mechanical obstacle to free action.

Instances of excessive accumulation of fat have always attracted more or less attention, and isolated cases are recorded by many authors. A certain amount of corpulence above the average is indeed very common among the well-fed, the indolent, and those who have little to occupy either mind or body. It is when it becomes considerable, confines the respiration, and renders the individual both unwieldy and inactive, that it attracts the attention of the physician. Gregory Horstius, Peter Forestus, Hieronymo Mercurialis and Peter Borelli, all mention instances in which their advice was requested, in order to diminish excessive corpulence, or to abate its inconveniences and evils. Smetius and Tulpius record examples in which the weight of the person was very much increased by this abnormal accumulation. The case of the former occurred in a lady of rank who weighed 427 pounds, or twenty-six stones and eleven pounds. That of Tulpius took place in a boy of fifteen, who at that age weighed two hundred and fifty pounds, or nearly sixteen stones;—a great weight for a young person of that early age, being about from four to five stones more than the weight of an adult man. Haller fixes the average weight of the human male at one hundred and sixty pounds or eleven stones six pounds; and though many persons are above this amount, they rarely exceed it without becoming unwieldy and inactive, a burden to themselves, and with more or fewer of their functions disordered and impeded.

An instance of corpulence, not void of interest, and certainly conveying some instruction, is that which took place in the person of George Cheyne, a physician who flourished at Bath during the first thirty years of the eighteenth century, and of which he has given a sketch in a sort of autobiography of himself in his work entitled The English Malady. This gentleman, who was originally of a large size, according to his own account, began life, at least his professional life, by eating and drinking as much as possible, being constantly in society, either at taverns or in the houses of friends, with the view, he candidly enough allows, of getting into business. After this had been continued for some time, he became very fat, he does not at first specify to what amount, very unwieldy, short-breathed, lethargic, and listless. He then became acutely ill in various modes, and was accordingly treated for his complaints actively enough. At this time he appears to have been in London. After he got a little better, and became both a sort of saint and a philosopher, he went by the advice of friends to Bath as a patient. Then, after a long course of sinning and reforming, between eating little and eating much by fits, and all sorts of inquiries and trials as to the use of vegetable diet, at least in part, for he seems never to have entirely relinquished animal food, and always drank not above a quart or at most three pints of wine daily, after ten or twelve years, he says, he exceeded in weight thirty-two stones,—that is, 512 pounds, or as Haller, who allows fourteen pounds to the stone, states, 448 pounds. This was about the year 1722.

This excessive enlargement was not only in itself a disease, but it induced, or was the means of inducing, others sufficiently serious. Constant dyspnœa, with convulsive fits of asthma, scrofulous ulcers of the legs, and eventually lethargic drowsiness after dinner were the earliest symptoms; then an attack of fever; then attacks of what he called erysipelas; and at length gout and rheumatic gout, were all successively complaints which this corpulent gentleman suffered. It is needless to pursue the long detail of all his symptoms, which is quite similar to that of all persons who eat and drink incessantly, and take little or no exercise.*

No general view of Obesity as a Disease and inconvenience was taken previously to the year one thousand seven hundred and thirty-four, when Augustus Frederick Walther, Professor of Anatomy at Leipzig, published his Dissertation *de Obesis et Voracibus Eorumque vitae incommodis ac Morbis.* This writer considers the effects of corpulence upon the organs of voice and respiration, upon the movement of the heart, upon the alimentary canal, and the pelvic organs; and upon the sanguiferous system in general, and the movement of the blood. Walther has some speculations upon the great pressure which the fat exercises on the blood-vessels, and on what he denominates *sanguinis spissius oleum,* which may be the *liquor sanguinis* of modern physiologists, and the balsam of the blood, to which he ascribes the property of keeping the oil fluid; and he insinuates, if he does not distinctly say, that in very corpulent persons, the balsam is no longer in sufficient quantity, or possesses sufficient solvent power to maintain the oleaginous part in a liquid condition. Though he allows, in considering the etiology, that in certain persons and families there is a tendency to the formation and deposition of fat, he nevertheless ascribes the growth, in the majority of instances, to excess in eating and drinking, associated with indolence.[*]

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* The English Malady; or, A Treatise on Nervous Diseases, in Three Parts. With the Author's own Case at large. By George Cheyne, M.D., Fellow of the College of Physicians at Edinburgh, and F.R.S. London, 1733. 8vo, pp. 342, 343.

Haller, first in 1756, directed attention to the isolated cases of excessive corpulence recorded up to that time; and made upon the cases such general observations as the scanty and not very accurate records permitted. He notices the insensibility of the skin, or rather the subcutaneous cellular tissue. Obesity, he observes, suffocates not only birds but men; of whom he adds many examples were then known. Above all, the weight which these persons have to carry is so disproportionate to their muscular powers, that they are sometimes wholly unable to move.[†] He infers that in the very corpulent the blood is diminished in quantity, the vessels are contracted, and yet the blood flows slowly and imperfectly.

Sauvages repeated the observations of Haller, attaching himself, however, more decidedly to its pathologica relations, and the means of curing the condition and alleviating and obviating its effects.[‡]

In the year 1753, Dr Thomas Shortt published an Essay on the Causes, Effects, and Prevention of Corpulence as a disease requiring medical treatment; and in the year 1760, Malcolm Flemyng sent forth his Discourse on the Nature, Causes, and Cure of Corpulency in a tract of some interest. Between this time and the close of the eighteenth century only two dissertations of any moment appeared; one by Riemer at Halle in 1778;[§] and one on the sound and morbid conditions of the Adipose Tissue by Reussing at Jena, in 1791.[‖] In 1811, Anege Maccary published at Paris his treatise upon *Polysarcia*,[¶] containing some new facts and several instructive observations.

The merits of all these dissertations may be said to have been eclipsed by an anonymous essay entitled Cursory Remarks on Corpulence, which appeared about the same time at London, and which in no long time went to a second impression. In 1816, the Cursory Remarks in the third edition appeared under the name of the author, Mr William Wadd, enlarged and rendered more complete as a medical treatise. Mr Wadd communicated all that was then known upon the subject; and, as his essay was on the whole both the most ample and the most instructive, it became a sort of authority on the physiology and pathology of corpulence. It was republished in 1829, and still maintained its position. It is a useful and instructive book; and though it has fallen under the criticism of the present author, yet it is perused with both interest and advantage. Mr Wadd impressed particularly in the treatment the propriety of observing very moderate diet; and though he allows the value of a vegetable regimen, yet he expresses the opinion that no just preference can be given to the efficacy of either animal or vegetable food in the reduction of corpulency, and that quantity in the amount of food is more to be attended to than quality.*

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[*] Augusti Frederici Walther, Prof. Lipsiensis, Dissertatio de Obesis et Voracibus eorumque Vitæ Incommodis ac Morbis. Lipsiæ, 1734. Extat apud Halleri Dissertationes, Tom. iii. p. 97. Item apud Delectus Opusculorum Medicorum Antehac in Germaniæ Diversis Academiis Editorum. Quae Collegit J. P. Frank, M.D. Vol. iv. Ticini, 1787. Dissert. v., p. 252.

[†] Elementa Physiologiae, Tomus i., liber i., pp. 49, 50. Lausannæ, 1757. 4to.

[‡] Nosologia Methodica, Tom. ii.

[§] Riemer Dissertatio de Obesitatis Causis Praecipuis. Halæ, 1778.

[‖] Reussing Dissertatio de Pinguedine sana et Morbosa. Jenæ, 1791.

[¶] Anege Maccary Traité sur la Polysarcie. Paris, 1811. 8vo.

The materials of the present volume were delivered in the form of the Gulstonian Lectures by Dr Thomas King Chambers in the spring of 1850 before the College of Physicians; and in the form of lectures they have been already before the public in the pages of the Lancet. This circumstance renders it less necessary for us to enter at large into the contents of the volume. But as the author has again examined the whole performance as first written, and has introduced such modifications and corrections as deliberate consideration suggested, and has further relinquished the lecture form, it is perhaps right that we advert to some of the principal and most instructive points in his treatise. It will be seen that Dr Chambers has brought to the investigation of the subject of Corpulence a large amount of correct chemical and physiological knowledge, that he has examined the questions as to the causes of the condition with great care, and with the aid of accurate statistical facts, and that he has endeavoured to give the whole inquiry a character of precision and practical utility.

Dr Chambers shows from various facts, that, though various articles of food employed by man and animals do contain fat or oil ready prepared as it were, yet that animals form fat from various substances which do not contain that principle. He further thinks it probable, that evidence does not distinctly show that animals find a source of adipose matter in their own bodies; yet that in unhealthy states of the system the increase of fat may coincide in point of time with the decrease of the healthy tissues.

Weight, Dr Chambers regards as one of the best modes of ascertaining the amount of fat, whether normal or in great excess. But it is requisite to determine what may be called the normal weight of the human body; and this again has a relation to stature. The following table, compiled by Dr Hutchinson, from taking the heights between five and six feet, with the weights, among 2650 men of average health, is believed to present a correct view of the relation between height and weight.

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* Cursory Remarks on Corpulence; or Obesity considered as a Disease: With a Critical Examination of Ancient and Modern Opinions relative to the Causes and Cure. Third Edition. By William Wadd, Surgeon. London, 1816. 8vo, pp. 129.

Height.		Weight.	
Feet.	Inches.	Stones.	Pounds.
5	1	8	8
5	2	9	0
5	3	9	7
5	4	9	13
5	5	10	2
5	6	10	5
5	7	10	8
5	8	11	1
5	9	11	8
5	10	12	1
5	11	12	6
6	0	12	10

The individuals upon whom these observations were made, were persons in the prime and vigour of life; capable of, and accustomed to make, great muscular exertions; for instance, sailors, firemen, policemen, grenadier guards, watermen, cricket-players, gentlemen, Oxford and Cambridge rowers and the like. A certain number of paupers and artisans may be placed against an equivalent number of draymen, wrestlers, and pugilists who are not inserted.

When weight depends on solid muscle and bone it does not bear so great a disproportion to stature as when it depends on fat; that is, if a person of a given stature exceeds the average in the preceding table by one or two stones, then it may be inferred that the excess indicates that the individual has so much more than the normal amount of fat. The mean height of thirty-six obese persons, whose cases are afterwards referred to, is five feet six inches, while their mean weight is eighteen stones one pound. As this is more than double the weight of the Bronze Tumbler (a statue), if made of flesh and blood, and exceeds the weight of the statue Theseus by one-half, it shows that these persons must owe great part of their weight to the presence of fat.

Some facts show that the weight of the human body is diminished, within the limits of health, during summer and increased during the winter months.

In persons prone to corpulence it is usually observed that the bony frame-work of the body is less massive than in the spare. Their hands and feet are smaller, compared with the size of the figure, than might be expected.

The volume of air which these persons are capable of containing within, or respiring from their chest, is considerably less than the average quantity of those of the same height. The lungs, instead of holding more air, because the body is larger, appear in these cases to be less capacious. Thus the pulmonary capacity of case 35 in the table, a man of enormous muscular strength, and in his youth remarkable for his power of wind, out to have been at least 250 cubic inches; it was only 205. No. 9, a female, held only 120 cubic inches of air, whereas she ought to have held 206, according to the table of averages published by Dr Hutchinson. No. 18, when in perfect health, five years ago, held 255 cubic inches, instead of 270 cubic inches. At present he holds much less, probably from congestion of the pulmonary tissue and increased corpulence.

From various experiments made to ascertain the cause of this disproportion, with the aid of Dr Sibson, Dr Chambers is disposed, to think that the motion of the diaphragm in forced breathing is equal to, if not greater, in these persons, than in others; but that the upper ribs in ordinary and also in forced breathing, move somewhat less than usual, but not to the extent indicated by the external surface.

In entering upon the consideration of the anatomical characters of Obesity, Dr Chambers states as established two points regarding the vascular system, the one, the presence of a large quantity of useless blood in the capillaries in general, but especially in those of the adipose tissue, and the other that the microscopical vessels are in their aggregate amount vastly increased.

These circumstances, he argues, receive further illustration from considering the causes of death in corpulent persons.

" With this intention," says Dr Chambers, " I have put together 69, of which the *post-mortem* records are thoroughly to be trusted, 67 having been examined at St George's Hospital,* and two by Dr Shearman of Rotherham, a gentleman of well-known accuracy and research.

" CAUSES OF DEATH IN SIXTY-NINE CORPULENT PERSONS.

Medical cases.

Dropsy	13
Apoplectic coma	11
Pneumonia	5
Pleurisy (acute 2) (chronic 1)	3
Fainting (fatty atrophy of heart)	1
Aneurism, 1; malignant disease, 1; fever, 1; rupture of stomach, 1; polypus uteri, 1	5
Erysipelas of face	1
	39

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* See the *Post-mortem* Books from January 1841 to January 1850.

Brought over, 39

Surgical cases.

Peritonitis after hernia	8
Erysipelas after ulcers and slight wounds...	3
Gangrena senilis	2
Diffuse cellular inflammation	2
Secondary abscess	3
Nephritis after lithotripsy	1
Diseased prostate	1
Accidents	10
	69

"The heart was examined in fifty-seven of these patients. In seven it was found healthy—viz., in four who died from accidents, in one case of rupture of the stomach, one of hernia, and one of nephritis. In the latter case, the principal local collection of fat was about the kidneys, where the amount usually found was greatly augmented.

"In fifty of the fifty-seven cases where the heart was examined, it was found diseased.

"Of the fifty diseased hearts,

5 were hypertrophied and not dilated;
8 hypertrophied and dilated;
26 dilated only;
11 atrophied.

In sixteen of these there was an increased amount of vesicular fat about the heart—viz.,

In 13 of those which were dilated;
In 2 of those which were atrophied;
In 1 of those hypertrophied and dilated.

"In fourteen instances, the kidneys were also affected with chronic degeneration, which in all those, where an opportunity occurred of forming an opinion, seemed to be consecutive on the cardiac disease.

"A cursory glance over the facts recorded in these lists will be sufficient to show what a great influence over life the disorders of the circulating system have had. In the medical cases, the two classes which make up the bulk of the whole may be referred entirely to this source; and in the surgical cases, nearly all are of a nature to be much aggravated by an ill-balanced distribution of blood.

"The fourteen cases of degenerated kidneys may also without force be referred to a chronic congested state of vessels, than which nothing, in my opinion, is more frequently the cause of that disorganization, which leads to hardening, deposit of oily globules, destruction of the urinary tubules, albuminous urine urea, in the blood and dropsy.

"The change which most commonly affects the heart is dilatation, probably dependent on the greatly increased quantity of capillaries distributed throughout the body, and the consequent increase in the amount and pressure of the circulating fluid upon the central organ. The hypertrophy which sometimes ensues is not unlikely to be an effort of nature to supply force in proportion to the increased demand.

" In eleven cases out of the forty-nine, atrophy of the heart was observed, that is, diminution in thickness of the walls without any external augmentation of size; and in such of these cases as were submitted to the test of microscopic examination, a deposition of *molecular* fat, destruction of the nuclei, and other evidences of degenerated muscle, were found.

" We must be careful to distinguish this fatty atrophy or degeneration from deposition of *vesicular* fat; the first arises from deficient nutrition, the second is due to excess. One is a retrogression from a more highly endowed tissue to one less distinguished by its importance and offices; the other is an increased growth. It is true, they may be coincident, as in the instances before us of atrophied hearts in obese people; yea, they may exist together in the same organ, as in two of these cases, where there was much fat at the base of the great vessels and degenerated muscle at the same time. But still they are contrasted conditions, hypertrophy and atrophy of different tissues.

" It still remains to be explained why these two opposite states are so often associated together; why degenerated muscle is more common in fat than in thin people, as would appear to be the case from a paper presented by Dr Quain a short time back to the Medico-Chirurgical Society. It does not arise from the pressure upon the muscle caused by the altered shape and size of the heart; for it is equally apt to occur in cases of obesity where there is only the ordinary amount of fat at the base of the organ, as where the adipose tissue there is augmented. It more probably depends on some change in the condition of the circulating fluid associated with obesity, which renders the formation of fibrin more difficult, and allows the muscular fibre to undergo an interstitial decomposition into an oily matter.

" The anomalous state of the circulation in corpulent persons, caused by the quantity of capillaries, either with or without the cardiac disease consequent thereon, is, I think, sufficient to explain all the complaints to which they are subject. The sluggishness of their blood's movement accounts for their proneness to cachectic boils, to diffuse cellular inflammation, to congestions of the lungs, liver, and brain, and explains why the use of the lancet is so hazardous in such patients."—Pp. 687–688.

The question of the antecedents and causes of corpulence, whether predisponent or exciting, appears to be not difficult. Excess in eating and drinking, the use, especially of considerable quantities of animal food, indolence and inactivity, are the main circumstances, under which this condition almost invariably takes place. It has very often been said that England is the country in which instances of excessive corpulence are most numerous and most frequently occur; and when the usual mode of living among those whose means permit, is considered, it is not extraordinary that such should be the case. Continental physicians also ascribe much influence to the large and frequent potations of strong beer; and Joseph Frank has specified porter as the liquor most likely to produce a great deal of this. Of the general correctness of this inference, scarcely any one who has observed distillery fed cattle can entertain any reasonable doubt. These animals, which are fed upon the grains and refuse malt after the low wine has been extracted from them, appear to be always either eating or in a stupid doze.

It is, however, in the general habits of the easy classes that may be found the tendency to adipescence. Large dinners, with the copious use of animal matters, cannot fail to induce an unusual degree of corpulence, when the practice has been long continued. With many also the business of eating is the great occupation of the day. To demonstrate the importance of the duty of dining in the estimation of this class of persons, the following statement may be sufficient.

"Walking with a friend," says Dr Charles Griffiths, "some years ago into a room at a tavern (in London), which was prepared for a public dinner, we discovered a very fat person sitting on a bench with his waistcoat unbuttoned, who, on the appearance of a servant (with a plate of what was mistaken for radishes) threw off his wig, and leaning backwards against the table, he opened his mouth, whilst the servant dropped into it one by one, some of these things, which on our nearer approach I found I had mistaken; my friend too recognizing the fat man, addressed him with concern, 'hoping nothing was the matter.' 'Oh, nothing at all,' he replied, 'only we have a dinner here' to-day, and I have undertaken to cater, so I have been taking a few of these 'here plugs, which the doctor says is only a little Castile soap, to help digestion.'

"What the composition of the *plugs* might really have been, I cannot pretend to say, but they certainly looked very like the soap he mentioned; here is an act (and my veracity stands pledged for its reality) that I think may challenge not only India, but the whole world to produce a parallel.

"One of our public singers here, whose vocal exertions are hardly attainable, unless the prospect of a great dinner is added to his hire, adopts a more summary mode of gratifying his palate; this beast having devoured enough to gorge a brace of pointers, quits the room, puts his fingers in his throat, and returns to consume as much more."*

Let the following instance from the same author be taken as an example of English habits abroad.

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* An Essay on the Common Cause and Prevention of Hepatitis or Disorder of the Liver; and of Bilious Complaints in General, as well in India as in Europe, &c. By Charles Griffiths, M.D., &c. London, 1816. 8vo, p. 76.

"During my stay in Bengal a remarkable, but there very common, occurrence took place. I was in the habit of visiting daily the sick of an Indiaman, which had lost one of her medical officers by death, whilst the other was absent; and going on board generally about the same hour was invariably invited by the second officer, who had charge of the ship, to sit down with him and partake of what he called his *Lunch,* consisting of beef steak, or cold beef, the former killed the preceding day. This I always declined; and when I last saw this young man, who was one of the most healthy and athletic men of my acquaintance, took some pains to convince him of the danger attaching to his diet, observing to him as I went over the ship's side, that he would, notwithstanding his great strength, 'get a knock-down blow from which he would not readily recover.' He replied, laughing, 'that his maxim was to live while he could;' but, dying in two hours after that day's *Lunch,* our parting became impressed on my memory; and more particularly on being informed by the gentleman left in the command, that he died of 'the cramp in his stomach;' in other words, he died (or I mistake much) of an injury sustained by the stomach in its attempt to exonerate itself of a large indigestible foreign substance on which its diminished contractile power could make no impression; and I am much inclined to the opinion that what is called cramp in India, very commonly is derived from some such violence done to this very susceptible and important part of our fabric, which in point of consequence in our construction yields not the brain, or the heart itself, although being endued with peculiar resources adapted to our imprudencies, the stomach is enabled to struggle with great and repeated aggressions."

It is impossible to doubt that Dr Griffiths is quite right in the observations he makes on such habits and practices. Their bad effects do not always appear at once; and therefore those who practise them proceed a long time in these courses. But the time comes at last when all these outrages to the assimilating powers of the stomach and the disposing capacity of the vascular system are peremptorily resisted; and the sufferer, who generally is little burdened either with observation or reflection, wonders how that which has been done so often and so long, should now prove so hurtful. He forgets the long career of unrestrained excess in which he has indulged.

On the subject of treatment, it must be a matter of interest to hear what Dr Chambers recommends.

"That form of the disease which commences at birth, and goes on increasing during infancy and childhood, is, I believe, so invariably fatal before the age of puberty, that I do not think we have reason for hoping that it is in any way amenable to medicine. At all events, I have not been able to discover any one whose experience has led them to pronounce it curable. It is a form of monstrosity, and as the subjects of it commonly display some other bodily malformation, and a deficiency of intellect, their death is a relief from a miserable prospect.

"When it begins in childhood, or about the time of puberty, we must not be deterred, by the circumstance of its being hereditary, from attempting to remedy the inconvenience arising from it. We cannot truly reduce our patients entirely to the average size and weight, but we may enable them to pass life in comfort and usefulness.

"The later the disease commences, the more controllable it is by management, until the middle period of life is passed, and then old age impedes in some degree the benefit which we may confer, not by rendering our measures inert, but by preventing our employing them quite so actively as we should have done earlier.

"The first thing indicated in all cases, is to cut off, as far as possible, the supply of material. Fat, oil, butter, should be rigorously interdicted in the diet table. But all eatables contain some portion of oleaginous matter, and especially those most convenient to advise the use of for a lengthened period. And, as we observe at the former part of our review of the light which chemistry has thrown on the subject, almost all are capable of a transformation into fat, when a small quantity of this substance is previously present. It is desirable, therefore, that the mass of food should lie in stomach as short a time as possible, in order that at least a fatty fermentation may not be set up in it. Very light meals should be taken at times most favourable to rapid digestion, and should consist of substances easy of solution and assimilation. To this end the time of the meals should be fixed for an early hour in the day, before exertion has rendered the powers of the entrails languid and weak. Breakfast should consist of dry toast, or, what is still better, sea-biscuit, and if much active exercise is intended, a small piece of lean meat. Dinner at one on meat with the fat cut off, stale bread or biscuit, and some plain boiled macaroni,* or biscuit pudding, by way of second course.

"Liquids should be taken not at the meal but half an hour after, so as not to impede the action of the gastric juice upon the mass. Here should end the solid feeding for the day; no second dinner or supper should follow, nor indeed any more meals be taken sitting down. A piece of biscuit and a glass of water can be taken standing up if faintness is experienced; a cup of gruel or roast apple before going to bed.

"This is not a scale of diet by any means unattainable. A butcher and retired pugilist, whose case I have tabulated (No. 35), has adopted it for some years with the greatest comfort to himself. He is able upon it to work in a most violent manner in a small garden which he cultivates for himself in the suburbs. He has reduced himself from 20 to 17 stone; whereas his brother, who has not the same strength of mind, has increased to 23 stones in weight. Persons of more refined education ought, and often do, practise the same self-imposed restraint more easily. J. R. (No. 7), has reduced himself from 22 to 18 stones, and sometimes brings himself down to 17, but finds that he derives no particular advantage from being of the lower weight.

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* "I cannot help pausing an instant to speak of the absurdity of our usual way of dressing macaroni. After being boiled and made palatable, it is sprinkled with cheese and placed before the fire, so as to form a tough, rancid, empyreumatic crust, nauseous and indigestible in the extreme. Boiled till soft, and eaten with French mustard or jam, it makes a soluble and wholesome dish, pleasing to the palate and the reason."

" The smallest amount of nutriment consistent with the health of the individual can be found by experiment only; but we need not fear that ten ounces of solid food a day is too little; for the last-mentioned gentleman confined himself for a long period to that quantity, and found his mental and bodily powers always equal to the strain which the pursuit of a laborious profession in London demands. It may be remarked by the way that it is often advisable to add a small allowance of malt liquor at dinner, as otherwise the craving of the appetite is less easily appeased. The beers to be avoided are of course the thick, sweet kinds; but that which is thoroughly fermented at a low temperature, in the Bavarian way, seems to contain very little injurious matter.

" I do not know that any advice concerning sleep is peculiarly applicable to obese persons beyond what we should recommend to all classes of men. A draught of morning dew, " nocturni roris auram ante solis ortum bibendam," which Aurelian* prescribes for the corpulent, is equally beneficial to every one. They are usually uneasy sleepers, and, though lethargic, by no means averse to early rising.

" In cases where the fat is largely accumulated in the omentum, it is very convenient for the patient to wear a band round the abdomen, which may be tightened gradually. The support thus given to the abdominal muscles relieves the dragging sensation in the loins, which many persons, whose viscera are heavy in proportion to their strength, experience. It enables exercise to be taken with more facility, and appears also by pressure to afford some assistance to the absorption of fat.

" The above remarks will apply equally to all forms of obesity; the abstinence recommended can be borne even by the aged, and only comfort be experienced.

" As respects exercise, however, a distinction requires to be made. The young and vigorous, whose obesity does not prevent the use of their legs, cannot employ them more usefully than in walking as long as they are able. The greater number of hours per diem that can be devoted to this exercise the quicker will be the diminution of bulk. But as riding, by the gentle shaking of the abdomen, excites the secretions of the digestive organs more, it should, where practicable, be employed in addition. Where freedom of motion has once been gained, rowing, shooting, any or all of the forms of British gymnastics should be adopted as regular habits.

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* Morb. Chron. l. v. cap. 4.

" But in the asthenic form of the disease, especially in elderly people, this is scarce practicable. The defect in muscular power prevents the use of the limbs in walking for a time long enough to be advantageous. But where riding can be managed, it should on no account be omitted, and the suspensory belt before-mentioned is often a valuable auxiliary to the employment of this exercise.

" The ancients were much more in the habit than we are of using various forms of friction to the skin in treating chronic complaints; and we find in Aurelian a recommendation to the corpulent to employ dry rubbing, either with cloths alone, or with the addition of various powders. Modern habits of cleanliness supersede in some degree these remedies. But the skin is not unfrequently greasy from a thick sebaceous secretion, and the circulation through it languid in asthenic obesity, and, in these cases, horse-hair gloves may be used with great advantage. Dr Flemyng strongly advises friction to be employed to the trunk of the body as promoting absorption and invigorating the surface.* The Greek additions of cold-bathing or sponging, especially with sea-water, the vapour or hot-air bath followed by rubbing with salt or with sand, and many other modifications of the same principle enumerated by Aurelian, will naturally suggest themselves to every intelligent patient.† The same author very sensibly advises these remedial measures to be employed fasting, and no food to be taken for some time afterwards, and modern habits render before breakfast a convenient time. To these rules of management, medicines, strictly so called, must be viewed as secondary and auxiliary, Unless these laws are obeyed, pharmacopœias are useless.

" Purgatives I have generally found not needed in the plethoric form; the bowels usually act once or twice in the day. But in the asthenic obesity of old people, where the abdominal walls are weakened by long pressure of an unnatural weight, it is necessary to employ them.

" But there is one class of medicines so universally applicable to all cases of obesity, that I think a trial of them should never be omitted. The chemical affinity of alkalies for fat, point them out as appropriate alteratives in this complaint, and experience proves that they are suitable to the state of the digestive organs. The most eligible one is liquor potassæ, and it may be administered in much larger quantities than any other. If given in milk-and-water, we may safely commence with half a drachm, and raise the dose to a drachm and a drachm and a half three times a day. The milk covers the taste of the potash better than any other vehicle. It has truly the disadvantage of saponifying a portion of the remedy, but there is no evidence to prove that its efficacy is thereby endangered; indeed, soap itself has been strongly recommended. A physician, whose case is recorded by Dr Flemyng, (*op. supra cit.,*) reduced himself, by alicant soap alone, two stones in weight.

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* Discourse on Corpulency, p. 15.

† " After this lecture, a gentleman present came up and told me that he had found in his own case of moderate obesity singular benefit from this measure. He had used the compendious hot-air bath heated by a lamp, and could compare the quantity of sebaceous secretion elicited only to the *vernix caseosa* of a new-born infant."

"I have often given the above-mentioned doses of liquor potassæ (even to children in cases of scrofula and consumption) without any harm arising from its use, when taken, as desired, in milk. The fear of alkaline medicines has probably arisen from the injury observed by Huxham,* to follow the use of Mrs Stephen's saponaceous mixture, at one time so popular, and therefore often misapplied. The injury appears to have originated from their being employed in improper cases, such as debilitated gouty subjects, chronic stone in the bladder, and the like, to which of course much harm would be done.

"In the case of Mrs S., (No. 6 of the list), very striking benefit followed rapidly the use of this remedy. She was, as may be seen by her weight, (28 stone 8 pounds), a woman of extraordinary size, and was becoming, when I first saw her, almost immovable. Her appetite was small, and she drank little, so that not much was to be done in her case by reducing the diet. A very short time after commencing the use of liquor potassæ, her shortness of breath left her, she was enabled to walk about with comfort; easy sleep at night, such as she had not had for months, returned to her, and the appetite, or, rather, relish, for the small quantity of food allowed her was restored. Instead of being confined to her chair, she has voluntarily come to see me from the extreme east of London several times, and I believe is now continuing to employ the drug from which she has experienced so much relief.

"Similar benefit was derived from liquor potassæ in Mrs Q.'s case (No. 24), whose weight was twenty stone, but was somewhat reduced by the remedy, as I am informed.

"A poor woman, who sold eggs in Chelsea, was becoming quite unable to gain her livelihood by her ordinary occupation. I have not kept a note of her weight and height, and therefore she is not mentioned in the table of cases, but she was extremely obese; and the cause of a variety of symptoms she complained of seemed traceable entirely to the accumulation of fat. By taking liquor potassæ only, without change of diet, she was reduced so far as to carry on her trade with comfort.

"F. V. (No. 2) and Celia S. (No. 17) are also deriving advantage under the alkaline treatment, but, as in the first case, it was preceded by a bleeding, and, in the latter, is accompanied by a great change of diet, the separate value of the remedy is not so well tested.

"Another case was communicated to me the other day of a gentleman who weighed 19 stone 7 pounds. By regimen, exercise, and liquor potassæ, he was reduced two stone and a half in six weeks.

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* Huxham on Fevers, p. 48.

"I have mentioned bleeding, and perhaps that may cause some surprise, after the observations which have been made on the state of the circulation in fat people. But where distinct signs of plethora are present—such as pain over the eye-brow, beating of the temples, restless sleep by night, lethargy by day, with full lips and an elastic skin—it is capable of being employed with safety; and where it is employed, the advantage derived at the commencement of a course of treatment is very great, for it gives all the other remedies a fair start; and by affording immediate relief to many symptoms, gives the patient a favourable opinion of the plan he has undertaken. It was of great use to F. V. & J. R., (Cases 2 & 7).

"On the other hand, it is scarcely necessary to say, that much risk attends the loss of blood; for if the heart has become atrophied and weak, it will not stand the shock. Venesection may cause either sudden death, from failure of the heart's action, or effusion of blood in the brain, from disturbance to the circulation."

Of the use of vinegar Dr Chambers disapproves; and iodine he regards as not efficient, and sometimes dangerous.

To these observations from Dr Chambers our limits will scarcely permit us to make any addition; and it is certainly to our readers more profitable to submit the instructions which the learning and experience of Dr Chambers have enabled him to collect, than to advance any thing of our own. The subject, nevertheless, naturally suggests one or two remarks which may here be more properly introduced than elsewhere. We have already seen the lesson which the case of Dr George Cheyne teaches both as to the antecedents of corpulence, the hurtful consequences of that condition, and the treatment which ought to be pursued in order to abate the evil and mitigate its effects. No one who peruses the account given by that gentleman himself can fail to perceive, that not only was the excessive corpulence the result of a long-continued course of intemperance, but that all the complaints which it engendered were kept up much longer than they otherwise would have been, and were greatly aggravated by the patient not adopting in good season a decided course as to restrained diet and regimen, and adhering with firmness and resolution to that course. The case was in truth mistreated for years, by having recourse to medicine with little aid from diet, and by not reducing the diet sufficiently both in quality and in quantity. It is indeed somewhat odd, to hear this learned physician talk of procuring large quantities of nuts;—filberts, walnuts, chestnuts, almonds, &c., and eating them with little moderation, by way of dessert after dinner, at a time when he ought, if he wished to be well, to have eaten neither dinner nor dessert. It was not wonderful that after such indulgences he had the erysipelas in the legs, the sickness and retching at stomach with colicky pains, and restless nights, and coughed up large quantities of gross viscid phlegm. No other result could have been expected to take place.

Consider, on the other hand, the not less instructive and greatly better managed case of Mr Thomas Wood, the Essex miller, as recorded by Sir George Baker.* While this instance shows equally well the effect of excess and intemperance in eating and drinking in inducing corpulence, and its most conspicuous inconveniences, it shows not less clearly and forcibly the decided benefit resulting from the adoption of a systematically restricted diet, and adhering to that with firmness and resolution. Mr Wood, it may be remembered, from the time at which he attained the state of manhood,—that is, we understand, the age of twenty one years,—was in the habit, for fully twenty-three years after this period, of eating voraciously three times daily, of fat meat, together with large quantities of butter and cheese. Strong beer was his common drink; and in that liquor, also, he indulged freely. The effect of all this over-feeding, with very little exercise, was, that in his fortieth year he began to grow very fat; yet finding his appetite good and his sleep undisturbed, he made no alteration in his mode of living or in the amount of his food. At length, however, the enemy who had been approaching was close at hand. The stomach, which had been so long taxed beyond its powers, refused longer to endure this hard duty. Mr Wood, in his forty-fourth year, began to suffer in the digestive organs. He suffered from constant thirst; he had attacks of heartburn; frequent sickness at stomach, pains in the bowels, fits of giddiness and headach; and his sleep was much disturbed. Next he had violent rheumatism, and frequent attacks of gout, with its concomitant, gravel, almost habitual. He had two epileptic fits, showing that the circulation of the brain must have been very much disordered. The symptom, however, which he considered most formidable, was a sense of suffocation, which often came on, particularly after meals. This might partly be the effect of mere plethora; but it is very likely that it was the commencement of disease of the heart. Under this complication of diseases, says Sir George Baker, every day increasing, he continued till the month of August 1764. Mr Wood was then in the forty-fifth year of his age.

It is unfortunate that this otherwise excellent record falls under the censure of Dr Chambers in this respect, that no accurate account of the bulk and weight of Mr Wood is given. He would indeed at no time allow himself to be weighed. All that is stated is that, when at his zenith of corpulence, he was a monster; and when he was reduced to a moderate size, it was conjectured that he had lost ten or perhaps eleven stone weight. This is probably not far from the truth, as country clergymen, farmers, and millers, are tolerably exact judges of weight from mere inspection. If so, he must have weighed when at the largest, almost twenty-two or twenty-three stones, probably more.

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* The case of Mr Thomas Wood, Miller of Billericay, in the County of Essex. Communicated by Sir George Baker, M.D., F.C., Physician. Medical Transactions of College of Physicians, Volume the Second. London, 1772. P. 259; and Volume Third, p. 309. London, 1785.

It is to be observed that it occupied nineteen years of excessive feeding to produce this degree of corpulence; and twenty-three years in order to thoroughly derange the functions of the stomach, fill to excess the whole vascular system, and derange the secretions so completely as to induce rheumatism, gout, gravel, epileptic attacks, and incipient disease of the heart.

At this time, August 1764, when Mr Wood was in his forty-fifth year, a neighbouring clergyman observing his bad state of health and extreme corpulence, recommended to him an exact regimen, and suggested the Life of Lewis Cornaro, as a book likely to be serviceable in instructing him as to the method of procedure. Mr Wood immediately reduced the amount of his food and drink, taking one pint of beer daily; and began to feel more active and less oppressed. This regimen he continued for two months, and then he diminished the beer by one half, reducing also the quantity of animal food. On the 4th of January 1765, in his forty-sixth year, he ceased to take malt liquor at all, and drank only water, eating animal food of only what are esteemed the light kinds. Under this system of living most of his complaints were relieved; but he was still tormented by rheumatism, and had occasional slight fits of gout.

On the 4th of June 1766, Mr Wood began the use of the cold bath, continuing it twice or three times every week, until the 29th of October 1767. The use of butter he had given up early in 1767; he avoided cheese after the 30th day of June 1767; and the 31st of July was the last time he took animal food. Since the last date his food consisted of pudding made by pounding and boiling coarse sea biscuit, previously mixed with two eggs. But as he found this was rather heavy, he afterwards restricted himself to the use of a pudding consisting of one pound of the flour of which the coarse sea biscuit is made, boiled with skimmed milk without any other article. One part of this Mr Wood took at four or five o'clock in the morning as breakfast, and the rest at noon as dinner, and no more food till next morning.

Under this mode of living for two years, going to bed at eight, rising between four and five in the morning, and using a good deal of exercise, Mr Wood not only reduced his size as already stated between ten and eleven stones, but got rid of all the complaints under which he had previously laboured. He got the better, 1st, of severe dyspeptic symptoms, 2d, catarrhal attacks, 3d, rheumatism, 4th, gout, 5th, gravel, 6th, a state of the cerebral circulation, which must have terminated either in palsy or fatal apoplexy, and 7th, symptoms which betokened incipient disease of the heart.

The regimen now mentioned was steadily continued, first for two years, counting from 4th January 1765; then for three years, counting to 30th January 1770; and at the time when he was last seen by Sir George Baker, 22d August 1771, it had been continued six years, six months, and three weeks, not only with the effect of diminishing the state of corpulence without injury to health and strength, but with the result of greatly improving both. In this course Mr Wood persevered to the end of life, which was twelve years longer. He died on the 21st of May 1783, in the sixty-fourth year of his age, in consequence of inflammation of the bowels, induced, it was believed, by getting wetted while riding on horseback in the rain.

This case may be regarded as a most successful example of the effect of restrained diet and strict temperance in curing completely and safely a great degree of corpulence, and permanently curing several painful diseases which are too often totally unmanageable by means of mere medical treatment and the administration of medicines. The case shows that restricted diet, especially if consisting chiefly of the Cereal grains, is perfectly adequate, without aid from medicine, to cure both corpulence and several of its most formidable concomitants. The cure indeed appears, if the intensity of the symptoms be carefully considered, to have been greatly more effectual and permanent than any of those which are ascribed in more recent times to homœopathy, hydropathy, and the other forms of alleged new and powerful therapeutic methods.

It can scarcely be too often impressed upon those concerned, whether physicians or patients, that restrained diet, in other words, great moderation, affords a much safer method of obviating and diminishing corpulence than that by means of medicine. It may also be perceived, that the practice sanctioned by Mr Wadd of allowing animal food under such circumstances, is rather a concession to the desires and frailties of patients than a measure either proper, safe, or necessary.

In an Appendix the author makes some judicious observations on Emaciation and its pathology, and the treatment required for each form.

This small treatise, the reader will perceive, contains the fullest information hitherto given on the nature and the causes of corpulence, and the best methods of treating corpulent persons, and showing them in what manner they ought to live.

ART. III.—1. *On Diseases of Menstruation and Ovarian Inflammation, in connection with Sterility, Pelvic Tumours and Affections of the Womb.* By EDWARD JOHN TILT, M.D., Physician to the Farringdon General Dispensary, and the Paddington Free Dispensary for the Diseases of Women and Children. London, 1850. Post 8vo, pp. 250.

2. *On the Preservation of the Health of Women at the Critical Periods of Life.* By E. J. TILT, M.D., Senior Physician to the Farimgdon General Dispensary and Lying-in Charity, and to the Paddington Free Dispensary for the Diseases of Women and Children. London, 1851. 12mo, pp. 142.

THERE are in use among medical writers and physicians four or five names which are employed to designate certain morbid states either of the female organs of generation alone, or of those organs with a morbid condition of the system at large. The terms AMENORRHOEA, DYSMENORRHOEA, MENORRHAGIA, and LEUCORRHOEA, are employed to designate certain morbid conditions of the womb and its appendages; and the term HYSTERIA is employed to denote sometimes a chronic condition of the system at large, sometimes acute attacks of the nature of paroxysms or fits, with which are often associated one or more of the complaints known under the names of AMENORRHOEA, DYSMENORRHOEA, MENORRHAGIA, and LEUCORRHOEA. These different affections have, it must be observed, been too often regarded by many physicians and physician-accoucheurs as diseases; and so, accordingly, has the treatment of them been undertaken and conducted. That, nevertheless, they are not substantive and individual diseases, but merely symptoms and effects of certain diseased conditions of the womb and its appendages, we believe is an inference which has been long recognized by many observers. The state of sterility, further, upon which a number of singular fancies have at different times prevailed, which is often associated with hysteria, either in the acute or the chronic form, has been traced to various morbid conditions of the womb, the ovaries, or the Fallopian tubes.

Though these views have been familiar to good observers and reflecting practitioners for a considerable number of years, no one has so decidedly placed them before the profession, or supported them with so much evidence and so many proofs, as the present author. Dr Tilt sets out with the principle, that the words AMENORRHOEA, DYSMENORRHOEA, MENORRHAGIA, and LEUCORRHOEA, each of which really symptomatically represents a great variety of lesions and morbid conditions of the womb, the vagina, the ovaries, and the Fallopian tubes, cannot be received by the pathological physician as things substantive, that is, as we understand, as essential and individual diseases or forms of disease, for the reason that from vague and general terms in medicine must spring vague and injudicious treatment. We believe, it must be allowed, that the treatment of these several complaints, or, to speak more accurately, the treatment of the complaints which have been the main cause and origin of these symptoms, has been too often irregular, desultory, empirical, and inefficient, chiefly because the treatment was not directed to act on the primary lesion, or, because, the remedy administered was not applied in the proper manner, and to the exact suffering tissue. Dr Tilt further proceeds throughout, upon the supposition that by looking to the primary lesion, which according to his view is very generally, if not constantly, seated in the ovaries and oviducts, that is the Fallopian tubes, the treatment may be rendered efficient, and patients may be promptly and satisfactorily delivered from their afflictions.

In the present treatise Dr Tilt does not propose to consider all the organic lesions enumerated as causes of Diseased Menstruation. He confines himself to the examination of those organic diseases only, by which he has reason to believe they are very frequently produced; namely, inflammation of the Ovaries and Oviducts. As a preliminary he directs attention to the nature and purposes of the function itself.

Menstruation, Dr Tilt defines to be a sero-sanguinolent secretion propelled by an Ovarian influence, from all or different parts of the generative intestine, and principally from the Womb. The first appearance of this secretion and its subsequent periodical recurrence exercises on the system and health of the individual an influence, which varies in different women and in different orders of women. The antecedents and concomitants of the secretion are believed by Dr Tilt to be illustrated by the following figures deduced from facts collected by M. Brierre de Boismont. With regard to the first appearance of the secretion among 645 women carefully questioned, in 375 the menstrual discharge appeared without previous symptoms, and in 228, its first appearance was preceded by pain and other symptoms of illness. Among 654 women, in whom the menstrual function was fully established, in 496 each monthly return was accompanied by symptoms; in 360 cases, the symptoms were both general and local; in 136 there were general symptoms alone. From these facts Dr Tilt infers that in only 158 females out of 654, that is about twenty-five per cent., were the menstrual periods unattended by precursory signs and concomitant painful symptoms.

The ovular hypothesis, or that which attempts to connect the menstrual secretion with a peculiar orgasm in the ovaries, accompanied with the enlargement and discharge of an *ovulum* or ovarian vesicle, Dr Tilt regards as on the whole the most satisfactory. That it has defects he admits; but these are fewer and less serious than in any other hypothesis hitherto proposed. Carus observed *ovula* floating in the fluid of fully developed Graafian vesicles in girls of from two to four years of age; yet in them no menstrual secretion had taken place; and in the instance of a noted woman condemned to suffer capital punishment for the commission of murder, and who had begun to menstruate twelve hours before execution, " no appearance of recent rupture of a vesicle, or of the discharge of an ovum, could be found in either ovary," according to the testimony of a careful observer. These difficulties and objections Dr Tilt thinks that the defenders of the ovular hypothesis are unable to explain.

In answering the question, What are the organs of menstruation, Dr Tilt involves himself in the obscurities of transcendental anatomy, and the mysteries of final causes. The uterus, he argues, stimulates the ovaries to increased action. The uterus itself derives its stimulus from the external organs of generation; and the reasons of its existence from the ovaries. The ovaries are the essential organs of reproduction; in them originate the greater proportion of those sympathies which have been called uterine; in short, the development of the pelvis, of the uterine system, of the *mammæ*, the function of menstruation, and all the peculiarities of the human female, depend upon the ovaries. The ovaries are also the organs of menstruation, because if they do not exist, though the uterus be present, menstruation does not take place. They, in short, regulate and govern the function of menstruation, so that if the latter be disordered or impeded, these irregularities must be traced to some previous morbid condition of the ovaries.

As healthy menstruation depends on the healthy structure of the Ovaries, so diseases in menstruation depend on a morbid condition of these organs; " for the phenomena of painful menstruation," says Dr Tilt, " when carefully analysed, may be often found to embrace the symptoms of sub-acute ovarian inflammation." As, however, the uneasy and painful sensations which women feel at the approaching periods of menstruation, are supposed by most of them to be inseparable from the function, medical assistance is rarely requested, unless when these sufferings are extreme in degree and protracted in duration. In this way, Dr Tilt thinks, not a few women continue to suffer for years complaints, which finally either greatly impair their health, induce permanent sterility, or prematurely bring them to the grave, when a little well-timed and judicious medical treatment might completely re-establish health, render them mothers, or otherwise avert those evils which so frequently embitter the lives of females.

In a discourse which follows the introduction, and to which the corresponding name of Prolegomenon is given, the author considers the mechanical means of ascertaining the presence, the nature, and the degree and extent of ovarian disease, or the different methods of ovarian exploration. These are four in number;—namely, 1st, abdominal examination; 2d, exploration *per vaginam;* 3d, exploration *per rectum ;* and 4th, the double touch, or that in which exploration by the vagina and that by the rectum are conjoined; the thumb being introduced into the former cavity, while the under finger is carried into the latter.

The morbid state which the present author thinks lies at the root of all the unhealthy phenomena and symptoms above enumerated, is what he denominates SUBACUTE OVARITIS, including under this denomination not only subacute but chronic ovaritis, and several not very well defined affections, which have from different observers received different appellations. Thus the secondary pelvic inflammation of Dr Evory Kennedy, the menstrual colic or abdominal pains more or less acute which appear in many females at the usual time of the menstrual illness, and the hysteralgic Dysmenorrhœa of Gendrin, are all arranged under the head of SUBACUTE OVARITIS.

The disease the author represents to consist in swelling of the ovaries, with increase of heat and pain aggravated by pressure, accompanied by intermittent or permanent pain or uneasiness in the ovarian region, radiating to the loins and the thighs, and producing, according to the constitution of the patient, an arrest of menstruation, or its profuse flow, intense local pain, or hysterical symptoms.

By sub-acute inflammation, as distinguished from acute, Dr Tilt understands not so much a difference in the intrinsic nature of the morbid phenomena, as a limitation of the inflammatory action, to certain distinct parts of the ovaries, as the ovarian follicle and portions of the ovarian tissue so small, that they give rise to little swelling and to no febrile action. This idea leads him to indicate as peculiar properties of the sexual system of females, the liability to inflammation of certain portions of the generative apparatus, in which the others may not participate,—a peculiarity to which the ovary is still more liable on account of its complex structure.

As the following passage contains statements which some may regard as contradicting each other, it must be given in the words of the author.

"Sub-acute OVARITIS, whether primarily developed as such or supervening on the acute inflammation of the ovaries, is necessarily a chronic disease, from the circumstance of the ovaries being subject to a periodical augmentation of nervous and sanguineous excitement. Chronic OVARITIS is always sub-acute; and as sub-acute inflammation of the *ovaria* is often present without being chronic, we have thought it best to adopt the appellation common to them both, instead of that generally made use of. Sub-acute OVARITIS is by far the more common, and, therefore, we will first proceed to its investigation.

"It is evident, however, that in the determination of causes, in the symptoms, and in the treatment of these two diseases, we shall find a great similarity; we shall also find that they may pass the one into the other, the sub-acute being exasperated into the acute, while acute *ovaritis* sometimes becomes sub-acute, or chronic, as it is then generally termed.

"We admit, then, two forms of OVARITIS;—1st, the sub-acute; 2d, acute OVARITIS; and, in attempting for the ovaries what has been so felicitously done for other organs, we will endeavour to show that the groups of symptoms which have been associated under the classic names of Amenorrhœa, Dysmenorrhœa, Menorrhagia, and Hysteria, are often the mere symptoms of sub-acute OVARITIS. —P. 40-41.

This last paragraph contains the whole doctrine proposed by Dr Tilt. The mode in which this doctrine is illustrated and explained is stated in the following terms.

"We admit that menstruation does not consist in the mere periodical discharge which may or may not accompany it, and that the maturing and periodical elimination of ovules is the primary fact of menstruation, and that which determines all the other phenomena of that important function. Now, if we inquire into the anatomical conditions of the ovarium, we find in its extremely spongy and erectile tissue, and in the great proportional development of its vessels, predisposing causes of inflammation. If we study the ovaria during ovulation, we find that there is a sanguineous turgescence of these organs, and an appearance of blood-vessels on and in the vicinity of the vesicle, which, like a small nut, protrudes from the ovary. This is followed by a gradual thinning, and progressive absorption, and bursting of the vesicle. This congestion and effort to eliminate a foreign body, and subsequent ulceration and cicatrization, when observed elsewhere are called inflammatory; they attend the natural function of the ovaria: but we must, however, admit that this physiological excitement may easily merge into the pathological condition, called inflammation. Having premised thus far, we will now proceed to state what is the pathological condition of the ovaria when sub-acutely inflamed.

"As with any other organs bounded by a serous membrane, the ovaries and peritonæum may be separately, distinctly, or simultaneously the seats of inflammation. Nowhere are adhesions, false membranes, and other products of inflammation, so frequently found as in that portion of the peritonæum which covers the generative organs of women. Some authors—Dugés, amongst others—have asserted that sometimes (although not exhibiting any false membranes) the peritonæal covering of the ovaries and the Fallopian tube still presents signs of inflammation, the peritonæum being thicker than usual, the subjacent cellular tissue having lost its transparency, being white, or else exhibiting spotted or striated suffusions, caused by the infiltration of a thick opaque serosity, of a white, pink, or yellow colour, or else distended with a gelatinous substance. Chronic peritonitis has been found more frequent in girls than boys, and mostly in those who had already begun to interrogate the secret sources of pleasure which lie hidden within them.

"The ovary itself is slightly increased in size, or double its usual dimensions, resisting and elastic; on pressure, it yields a sensation of fluctuation; its surface is smooth, polished, and glistening; its tissue more red than natural, though less resisting; congested with blood, as described by Negrier, or moist with a sero-viscous fluid, called spermatic by Bonnet, Lieutaud, and others, in consonance with what was then the name of the ovaria, *testes muliebrum*, and in harmony with the then current opinions of the day. It is traversed by a number of smaller vessels, especially in the neighbourhood of the cells, which, placed at the surface of the organ, contain ovules, and may be healthy or diseased.

"The vesicles have been found presenting *individually* evident signs of all the different stages of inflammation, although surrounded by a perfectly healthy stroma; the parietes of the vesicles have been found highly vascularised, so as to look like red currants, friable, lined with false membranes, or full of well-formed pus—minute but unerring testimonials of previous inflammation. The proof of their chronic inflammation has still more frequently been observed. They may be hypertrophied, of the size of a pea, or larger, round, or falciform, with an extremely dense white internal membrane, having a polished surface of the thickness of parchment. They may be also found pellucid, having interposed within them and the parenchyma of the gland one or two other distinct membranous layers, with or without intermediate granular matter. They may contain either a green, yellow, or fatty liquid, or a pulpy substance, like the interior of an encephaloid cyst, or even solid saline concretions, as observed by Morgagni. The vesicles are sometimes found, on the contrary, atrophied and blighted; their liquid contents being partly absorbed, the follicles are no longer fully distended, but look like wrinkled sacs, of a white or greyish colour; and here we may observe, that, however difficult it may be to understand, inflammation is known to cause sometimes hypertrophy of the ovaria, while at other times, under the same mysterious influence, the ovaries of young women have been found as hardened and collapsed as those of women who have outlived the period of active ovarian life. These white bodies and cysts are never observed before menstruation; but they may be met with in every other stage of life, in virgins as well as in prostitutes. From the nature of these lesions, which are evidently inflammatory, we are able to infer the relative frequency of various stages of inflammation in one or more of the ovarian follicles.

" Heretofore, the minute lesions of these organs have been neglected, because they did not embody an idea, or uphold any particular point of doctrine. As the physiology of the ovaria scarcely dates from later than yesterday, we need not be surprised at finding their pathology in an embryonic state. These lesions have been cursorily noticed by embryologists or physiologists, studying the ovaries from their own peculiar points of view; and, when the numerous ovarian lesions are studied with the microscope, and other resources now called to the aid of the anatomist, and the facts elicited are put together by means of a constructive idea, it will then be no longer difficult to present a richer display of anatomical facts than the meagre elements of information we now possess.

" When sub-acute ovaritis occurs in the puerperal state, the ovaries are found greatly increased in size, their tissue becomes more friable, and infiltrated with yellowish or violet-coloured serum, sometimes resembling that of the spleen, but at other times it is more infiltrated with serum, slightly tinged with blood. In recording these lesions, and ascribing to them their due value, we must not, however, forget that the ovaries may be partially, and even seriously inflamed, without the power to perform their proper functions being permanently compromised. Do we not see the substance of the lung recover from the solid state, and again become permeable to air when the patient is cured of acute pneumonia?

" The liability of the Fallopian tubes to inflammation is proved by their often presenting undoubted traces of its having existed. This is not only the result of our own experience, but it is confirmed by the testimony of those who, like Dr Ashwell, Dr R. Lee, and Professor Cruveilhier, have alluded to lesions of the ovaries, and of their ducts; and Dr Hooper, in the few pages prefacing his admirable delineations of uterine and ovarian disease, does not hesitate to say, that 'the Fallopian tubes are frequently found to have suffered from inflammation.' Their inflammation is almost always a consequence of ovaritis or metritis, and is confounded with these diseases, exactly in the same way as Fallopian cysts are confounded with ovarian—a confusion of diseases which, as the same treatment is required in both cases, is indeed of but little consequence. As regards the morbid conditions which have been noticed, the fimbriæ may be found preternaturally florid, highly vascular, filled with blood, attached by recent false membranes to the ovaries or adjacent organs, or bound down to the same by firm, thick bands of long standing. The fimbriæ of both Fallopian tubes may be found destroyed, but in general those only of one or the other are seen to be totally so.

" This is a lesion of very frequent occurrence (Dr Hooper), and with it generally coincides the obliteration of that extremity of the tube by which it communicates with the peritonæal cavity. The oviducts then terminate in a cul-de-sac, they are also increased in size, and are mostly tortuous or of a pyriform shape, and their sides are thicker than usual, and fluctuating when pressed. On being opened, they are found to contain a serous, albuminous, puriform, or bloody fluid, and their internal surface is covered with tenacious or flocculent albuminous substance, the removal of which exposes tissues which are inflamed and softened. We may here observe, that however frequently obliterations of the Fallopian tubes may have been found, their imperforation, whether congenital or accidental, has been very seldom met with. A web of false membranes has been often discovered lining the interior of the oviducts of prostitutes, and of those women who have recovered from puerperal metro-peritonitis; whereas the same tubes are often found full of mucus. or even pus, in those who have died in the acute stage of the disease, Whether or not this condition furnishes any direct therapeutical indication, we will leave for future consideration.

"In some cases, the oviducts may be perfectly healthy, and still unable to perform their allotted task, owing to the existence of false membranes, by which they may be glued to the neighbouring viscera, so as to preclude the possibility of their precise adaptation to the ovaries. Varying in density, from that of the finest diaphanous film to that of strong ligamentous bands, these false membranes are of very frequent occurrence; and, in prostitutes, the ovaries and Fallopian tubes are seldom found without some one or other of the lesions already described, if we may rely on the testimony of Walker, Renaudin, and Dr Oldham."—Pp. 41-48.

It is difficult, in treating of such a subject, to separate the occurrence of the alleged morbid process from the consideration of its antecedents, or the causes which are most like to induce it. The principal predisposing cause of both forms of disease, subacute and acute OVARITIS,—for what induces the one may induce the other,—Dr Tilt places in the nature and function of the genital organs; and in so doing he recals and impresses the anatomico-physiological fact, that the Fallopian tubes must be regarded as the ducts or conveying channels of the ovaries, and that, consequently, the ovaries, Fallopian tubes, and interior of the womb, are to be viewed as all forming one simple continuous intestine, as it were. The periodical congestion of the ovaries during the approach of the menstrual orgasm, and the analogous congestion which is known to take place during sexual intercourse, the author views as the main predisposing causes of this form of ovaritis. In other words, the frequent vascular excitement to which these organs are liable by virtue of their functions, renders them liable to vascular irritation, which may and often does proceed to inflammation. "We may therefore admit," he says, "that if by any cause this congestion were carried to a greater degree than ordinary, or protracted beyond the usual time, general inflammation might attack the organ itself, having its source in the local irritation of which the ovaries are the seat, at each menstrual period; we find accordingly that, in many of the published cases of *ovaritis*, the disease comes on at the time, and instead of, the menstrual discharge."

He further allows that constitutional peculiarities may act as predisponent causes; and that in young females of particular temperament, not only menstruation, but marriage and its consequences, and mental emotions may all tend to induce this subacute form of inflammation. The phenomena of the lives of public females and others of dissolute habits, as well as the appearances well known to be presented by the ovaries of such persons after death, show clearly enough, the influence of sexual intercourse under certain circumstances, in giving rise to local and partial *foci* of inflammation in these organs. The surfaces of the ovaries are always hard, rough, and irregular, covered with thick cartilaginous and pearly-like patches, which must have been the remains of inflammatory exudation. Cicatrices or scratch-like scars also are observed on their surface. In their interior are often seen vesicles much larger than the healthy Graafian vesicles, containing yellowish or reddish semifluid matter like jelly. In other instances, hard specks and tubercles are observed. All these appearances are most probably to be regarded as effects of the vascular orgasm and excitement, to which these organs in such persons are habitually subjected.

On other causes, such as those arising in a highly civilized community, where the appearance at least of immorality must be more or less sedulously avoided; or the circumstances of young widows, and those of females whom Dr Tilt designates as involuntary virgins,—a class of persons who, he maintains, are very numerous, and daily increasing in numbers,—we must refer the reader to the work itself. Some doubts, perhaps, may be entertained of the correctness of the inferences, more especially those which imply the predominant and tyrannical influence of those mental emotions connected with the organs of generation, and to which influence, and the struggle between this and the moral part of the constitution, Dr Tilt ascribes many of these attacks. We are unwilling to express any decided opinion, further than that we think reason and modesty are, in the majority of cases, sufficient to counteract those feelings, when they are proceeding to an injurious extreme. Whether they are adequate to prevent the struggle to which Dr Tilt refers, and its effects, it is not easy to say; and we are perfectly willing to give the author the benefit of the doubt. If it be the fact, that reason and modesty, aided by religious principles, are inadequate, then more care than ever ought to be taken in the education of young females, especially in the better ranks, where circumstances unequivocally enough show that all cannot enter into the matrimonial state.

Of exciting causes, the following are enumerated:—1. Mechanical causes; as falls on the feet or the knees, or the sacrum; riding immediately after menstruation; and the necessity for employing instruments. 2. Pathological conditions of the neighbouring parts; the retention or suppression of the catamenia; the transmission of inflammation from the uterus to the ovary by the Fallopian tubes; as in instances of ulceration of *cervix vteri;* and even catarrhal inflammation of the uterine part of the vagina; in malpositions of the womb. 3. Specific causes; as the puerperal state; the rheumatic diathesis; and blenorrhagic infection.

The description of the symptoms is carefully given; but for its details our readers will consult the work. The author never loses sight of his position that Dysmenorrhoea, as described by authors, is in many cases sub-acute *Ovaritis.* The disease assumes four types; the Amenorrhoeal, the Dysmenorrhoeal, the Menorrhagic, and the Hysterical; and he illustrates the leading characters of each by the detail of six cases.

Then follow, in Chapter Fourth, some judicious observations on Sterility, which are also illustrated by the particulars of five cases. It speaks favourably for the candour of the author, that in the last of these cases, he allows that he had at first taken an erroneous view of its nature, and it was only after he had rectified this view, and changed the treatment in accordance with the change in opinion, that the symptoms were relieved, and the patient finally recovered.

One of the best proofs of the correctness of theoretical principles is within certain limits, the degree of success which attends the treatment founded on these principles.

The treatment inculcated by Dr Tilt has for its object principally the subduing of inflammatory action. This he attempts by a modification of the antiphlogistic treatment. General blood-letting he eschews as rarely necessary, indeed never, if we understand aright; but local blood-letting by means of the application of leeches, he frequently prescribes; then revulsion or counter-irritation, as it is commonly called, by the use of blisters, with the sorbefacient influence of mercury, and the administration of laxative medicine, constitute the principal remedial agents. Enemata, either simply emollient and soothing, or anodyne, and sometimes of cold water, as sedatives, he employs as adjuncts to the use of leeches and vesication; and vaginal injections he also regards as serviceable auxiliaries.

Medicated inunctions, consisting of mercurial ointment with camphor, extract of belladonna, hyoscyamus, or opium, and occasionally iodine ointment, are mentioned as useful adjuncts.

In the sixth chapter, Dr Tilt treats of ACUTE OVARITIS. This is a disease with which the profession are most familiar, in connection with that complex and formidable disease, Puerperal Fever. No doubt can be entertained, nevertheless, that

that the disease does take place independently and without any connection with puerperal fever.

The lesions which take place in the ovary when acutely inflamed, "are in themselves more apparent and similar to those produced by inflammation in other organs. If the inflammatory process has been sufficiently intense, or has not been actively treated, the ovaria in the course of a few days swell to a considerable bulk; and if by chance an opportunity is afforded of examining them, they are found to contain pus, either infiltrated in the tissue of the organ, or disseminated in its various parts. These purulent deposits scattered through the ovaries have been described by Negrier, and considered as inflamed Graafian cells, filled with pus of their own secreting."

"These collections of pus, if not artificially opened, have a tendency to empty themselves into the neighbouring organs, when they will be found to communicate, by fistulous passages, with various parts of the intestinal canal, with the bladder, or with the vagina, or to open into the peritonæal cavity. T. Bonet, Shenckius, Merat, and Dr Seymour have related cases wherein the ovaries were found to be in a state of gangrene. We must remark that, in these acute cases of inflammation, the adjacent cellular tissue is also inflamed, and that this adds considerably to the size of the tumour, and to the extent of its suppuration—indeed, some authors think that pelvic tumours originate principally in the pelvic cellular tissue. The ovarian peritonæum is also implicated in the general inflammation. It is covered with false membranes, causing it to adhere to the neighbouring organs, and these adhesions (if the patient survive) are transformed into those solid bands which interfere with the play of the pelvic viscera, and frequently cause abortion.

"The coincidence of abscesses in the ovary and the corresponding oviduct were noticed by Morgagni, and afterwards by Andral, Dalmas, and Haase. In a post-mortem examination, Cruveilhier found both the ovary and the corresponding Fallopian tube distended with pus, the tube being adherent, and the ovary so softened in the vicinity of the adhesion, that it would soon have allowed its contents to pass through the tube to the uterus.

"The pathological lesions of puerperal ovaritis are sometimes seen to differ from those just described. Pus may be found in the ovarian veins, though not so frequently as in the uterine. Cruveilhier considers the lymphatics to be more commonly distended with the pus they have absorbed; and in several of the plates of his *Pathological Anatomy*, he has shown the deep and superficial lymphatics of the ovaries and broad ligaments replete with purulent fluid. These vessels have been sometimes mistaken for veins; but when the pus is removed from the lymphatics, those structures appear perfectly healthy; whereas, when veins are inflamed, their tissues are thickened, have become more fragile, and are lined with false membranes. The size of the tumour is often more considerable and the stroma loses all traces of organization, being more or less changed into a milky sero-purulent magma, or into a greyish sanious matter, or a vascular pulp, which is almost diffluent, and approaches very nearly to the condition of gangrenous decomposition, since it indicates the total disorganization of the ovarian tissue. In some cases of puerperal metro-peritonitis, Cruveilhier, Boivin, Dugés, Seymour, and Dr R. Lee, have found on post-mortem examination the diffluent ovaries ruptured, without it being possible to ascribe the rupture to any violent traction; and the shreds of the organ being mingled with pus and peritonæal effusion, have, no doubt, been described as the result of gangrene by the older authors. In these cases, was not the ovarian rupture the cause of the fatal peritonitis?—Another important pathological distinction between puerperal and idiopathic ovaritis is, that in the latter the adjacent peritonæum is frequently not inflamed, and for years form an efficacious boundary to ovarian disorders; but in the puerperal variety, as might have been pre-supposed, the ovarian peritonæum soon participates in, and often even originates, the disease—a disease which is the natural sequence of the high susceptibility to morbid action brought on by parturition, and of the increased flow to the pelvic organs of blood containing a greater proportion of fibrine than usual."—Pp. 149-152

In the eighth chapter, on Terminations of Acute OVARITIS, Dr Tilt examines with care the various modes in which this disease is liable to terminate; and illustrates these modes of termination by the details of twelve instructive instances of the disease.

In the ninth and concluding chapter the author explains at length the treatment which it is requisite to pursue, in order to obtain a favourable termination of the disease.

In the foregoing account, it has been our desire to communicate a correct abstract of the hypothetical principles impressed by Dr Tilt, and the practical applications thence deduced. On the merits of these doctrines, and on the question to what extent they are well founded, we have refrained from giving any opinion, as it appears more important that they should be made known, than that their correctness should at present be strictly scrutinized. It would be difficult to deny, that these doctrines contain a certain amount of verisimilitude, and it may be granted, of truth. It is probable that, in a certain proportion of instances of Amenorrhœa, Dysmenorrhoea, Menorrhagia, and Hysteria, the circulation of the ovaries may be in some degree deranged. But whether this derangement in circulation, in all cases, amounts to inflammation, and whether such inflammation be really the cause of the other disorders, appears not yet to be perfectly established. To consider inflammation of the ovaries, even sub-acute, as the author denominates it, as the invariable and constant cause of all the disorders in menstruation, will probably be regarded by many as a generalization too violent and too exclusive to be readily admitted. Pain cannot in all instances, it is well known, be regarded as denoting the presence of inflammation; and when the various and often opposite means, under which the symptoms of very painful menstruation disappear and subside, are considered, it will scarcely be conceded, that in all these cases positive inflammation existed. One class of cases derive benefit from the judicious and persevering use of the warm bath; another are alleviated under the use of gentle laxative medicines, either alone or alternated with opiates; in another class, benefit results from carefully regulated diet and exercise, with suitable clothing; and in other instances, amendment takes place with little or no aid from medical treatment at all. It must further be allowed, that the local bleeding recommended by Dr Tilt can in few cases do harm; and though it did good, the result would scarcely be sufficient to prove, that inflammation had existed.

It may, in short, be maintained, and we have no doubt will be maintained, that in a large proportion of instances of painful and otherwise disordered menstruation, the pain and painful sensations which are felt, denote the presence, not of inflammation, but of irritation, and something neuralgic. This is not the place to enter into the distinctions, whether well founded or not, between these two processes, or to consider the evidence upon which the distinction between them rests. It is sufficient to observe, that they have been recognized by most sensible practitioners.

In many instances, accordingly, the phenomena which Dr Tilt describes as indicating inflammation of the ovaries, will be regarded by others as denoting vascular irritation of those bodies—a state which, probably only in extreme cases, advances to inflammation. It is well known that the phenomena of painful menstruation take place mostly in nervous, irritable females, and that these phenomena are often most speedily and effectually alleviated by the remedies which abate and remove this irritability. They indeed belong to that class of persons whom the late Dr Parry of Bath, a great advocate for the predominance of inflammation in many diseased conditions, would have designated as presenting marks of irregular determination of blood.

It is, nevertheless, an advantage of the hypothesis of Dr Tilt, that the view of it now submitted, militates not against the method of treatment which he has inculcated. That treatment is, in many respects, the exact method which the most successful practitioners employ in order to remove diseases of irritation.

Though the hypothesis proposed by Dr Tilt will probably be opposed by not a few on the grounds now mentioned, it is just to that gentleman to say, that he shows much knowledge and ingenuity in explaining and defending his views; and whatever may be the ultimate fate of the hypothesis itself, it is impossible to deny that he is entitled to a fair hearing, and that his book must be serviceable to the practitioner, both for the information which it conveys, and for the ideas which it cannot fail to suggest.

The second treatise in our list by Dr Tilt is on a subject intimately connected with that of the first. While the first is a treatise etiological, pathological, and therapeutic, the second is tobe viewed as a Hygienic or Prophylactic Discourse. Impressed with the supposed prevalence and misunderstood character of disorders of the menstrual function, and believing that many of these disorders originate in neglect, and ignorance of the proper management of young females, the author undertakes to give instructions, by attending to which, he is persuaded, many of the evils consequent on disordered menstruation may be prevented in their origin, and all may be obviated, and in different degrees alleviated.

It is impossible to doubt, that by thus beginning at what may be termed the origin and root of the matter, great evils may be avoided and prevented. The undertaking is one requiring both knowledge and a considerable amount of judgment. It embraces two divisions, moral management, and physical training, in obedience to physiological principles. As Dr Tilt is convinced, in the first place, from the evidence of multiplied facts, that in the moral and physical management of young females much evil prevails and several errors are committed, and as he ascribes these errors to the ignorance of mothers, and thinks that this can be counteracted only by medical influence, he undertakes to enlighten this important section of the community, by showing them the nature of the duties which they have to perform, in superintending the corporeal health and mental constitution of young and growing females. With this object in view, Dr Tilt published, in the Provincial Medical and Surgical Journal, a series of papers on the Right Management of Women, before, during, and after the Cessation of Menstruation; and the notice which he informs us these papers received, became to him an inducement for re-considering the subject, and, as we understand, publishing his matured views in the present form. The circumstance now mentioned renders it unnecessary for us to enter into a detailed examination of the present work; and we must be satisfied with merely mentioning, in general terms, the purposes of the author, and the subject and object of the book itself.

It is right, nevertheless, to say, that we are not entirely unvisited by an idea, that the author may have in some degree exaggerated the evils referred to, as well as the causes from which he thinks these evils proceed. Most mothers know from personal experience what are the changes which take place in the system of the female at and about the approach of puberty; and females in general are not deficient in the importance which they attach to the due, regular, and safe establishment of the secretion, which marks the approach of that period. Treatises also more or less elaborate have been written on different departments of the subject, either for the information of medical practitioners or the instruction of parents; so that, if the evils exist to the extent estimated, remedial measures are not altogether unprovided.

In 1835, M. Bureaud Rioffrey published, on the Physical Education of Young Girls or the Hygienics of Women before Marriage, a treatise which contains much information and not a few serviceable suggestions* on the mode in which young females ought to be educated, both physically and morally. In 1842, Mr Edwin Lee published an English translation of the third edition of the French work of M. Aimé-Martin on the Education of Mothers of Families.† The original of this work had been honoured with the prize of the French acadamy, and therefore may be supposed to contain the best information which could be obtained at that time. The work is much more comprehensive than that by M. Bureaud-Rioffrey, as the author enters more into the philosophy and literature of the subject, and bestows great attention upon the subject of literary and moral education. It is an objection, nevertheless, to this otherwise useful work, that the author is not only discursive, but has probably attempted to take too wide a range; and the result is, that the work is less practical than it would have been, had it been confined within narrower limits. We fear also that the style of the work is not exactly suited to the taste of English readers.

If a work be really required, on the other hand, to instruct mothers, and persons likely to be consulted by them, on the nature of these duties, and the mode in which they ought to watch over the health, moral and corporeal, of the young persons committed to their care, the present treatise by Dr Tilt may be recommended, as well calculated for the purpose. It is short and condensed; does not dwell too much or too long on any of the collateral subjects; and the information which it convey comes at once to the direct object. The author also shows that he is deeply impressed with the importance of the duty which he undertakes; and he shows both sincerity and judgment in the manner in which he gives his advice.

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* Education Physique des Jeunes Filles, ou Hygiene de la Femme Avant Le Mariage. Par A. M. Bureaud Riofrey, D.M. &c. Paris, 1835. 8vo. pp. 352.

† The Education of Mothers of Families; or the Civilization of the Human Race by Women. By M. Aimé-Martin. Being the work to which the Prize of the French Academy was awarded. Translated from the Third Paris Edition, with Remarks on the prevailing methods of Education, and their Influence upon Health and Happiness. By Edwin Lee, Esq., &c. London 1842, post 8vo, pp. 384.

His practical directions are summed up in the following twelve aphoristical paragraphs.

"1. To keep a girl in the nursery as long as possible.

"2. Not to let her be taken unawares.

"3. Never to seek to determine first menstruation by forcing medicines.

"4. Never to give or take forcing medicines to promote the reappearance or the increase of the menstrual flow.

"5. Never to give or take purgatives during the week before and after menstruation, unless by medical advice.

"6. Never to allow a daughter's constitution to be undermined by profuse or very painful menstruation, or by permitting it to return at shorter periods than once a month.

"7. Never to be so reckless of her own, or her daughter's, health, or so unjust to her medical adviser, as to let him prescribe in ignorance of her state.

"8. A respect for whatever may have received life.

"9. A knowledge of the possibility of menstruation continuing during pregnancy, and of the danger of confounding this with other sanguineous uterine discharges.

"10. A knowledge of the possibility of menstruation continuing during lactation without in any way forbidding it.

"11. A knowledge of the reality of the dangers by which the change of life is attended.

"12. A conviction that these dangers can for the most part be avoided by a judicious line of conduct."—Pp. 141–142.

ART. IV.—*Of the Causes, Nature, and Treatment of Palsy and Apoplexy; of the Forms, Seats, Complications, and Morbid Relations of Paralytic and Apoplectic Diseases.* By JAMES COPLAND, M.D., F.R.S., Fellow of the Royal College of Physicians, &c. &c. London, 1850. Post 8vo. Pp. 414.

OF the present treatise a considerable portion was published many years ago in the first and third volumes of the author's Dictionary of Practical Medicine; and several of the chapters on the connection of paralytic and apoplectic seizures, with other disorders, formed the Croonian Lectures for the years 1846 and 1847, at the College of Physicians, London. Dr Copland has now published the whole in a connected form, in the belief that palsy and apoplexy should be studied in intimate connection not only with each other, but also with other diseases, of which they are often the consequences and terminations, and with other affections which are frequently associated or complicated with them.

In publishing the treatise in the present form, it is right to mention, that Dr Copland has introduced, from various respectable sources, several useful additions and important pieces of information.

The treatise in its present state may be justly recommended as an excellent monograph, pathological and therapeutic, on the subject.

Art. V.—*The Anatomist's Vade Mecum. A System of Human Anatomy.* By Erasmus Wilson, F. R. S. Fifth Edition. London, 1851. 12mo. Pp. 656.

In the Sixty-Seventh volume of this Journal, p. 298, we took occasion to direct the attention of our readers to the third edition of this work as it appeared in 1845. Since that period nearly six years have elapsed, the work has gone through a fourth edition, and the fifth is that which is now before the profession.

It gives us sincere pleasure to observe that the work is one of great merit, and very ably sustains the character which we gave in 1845. Mr Wilson has taken great pains to introduce all the valuable information which has since that time been communicated on various points, especially of minute structural anatomy. Thus he gives a short sketch of the observations of Mr Rainey on the minute structure of the lungs as ascertained by the microscope, and an abstract of the observations of Mr Bowman and Mr Toynbee on that of the kidney.

The utility of this treatise is greatly enhanced by numerous well-executed illustrative figures. In all respects it forms a most serviceable guide to the student of anatomy.

Art. VI.—1. *On Poisons in relation to Medical Jurisprudence and Medicine.* By Alfred Taylor, F.R.S., Lecturer on Medical Jurisprudence and Chemistry in Guy's Hospital. London, 1848. Post 8vo. Pp. 855.

2. *Medical Jurisprudence.* By Alfred Taylor, F.R.S., Licentiate of the Royal College of Physicians, Member of the Royal College of Surgeons, and Professor of Medical Jurisprudence and Chemistry in Guy's Hospital. Third Edition. London, 1849. Post 8vo. Pp. 849.

The subject of Toxicology, or that branch of medical jurisprudence which treats of poisons and their effects, is so extensive that it is difficult to treat of it properly within the limits assigned to the ordinary systems of Medical Jurisprudence. Poisons are also so numerous, and the effects to which they give rise so closely resemble several diseases, that to consider them properly in all their relations becomes a most complicated and arduous undertaking. Although, therefore, the wishes of the student often are, that the whole subject be comprised within one volume of moderate size, yet the experience of the most practised teachers and writers has been favourable to the allotment of separate treatises to the subject.

This example Mr Taylor has found it requisite, upon the present occasion, to follow. When he published his work on Medical Jurisprudence in 1844, he included in it a divison on Toxicology. It must have been manifest to those acquainted with the subject that this could not be continued, if justice was to be done to the subjects of Medical Jurisprudence and Toxicology. Although, therefore, Mr Taylor has, we presume for the sake of students, retained the division upon poisons in his work on Medical Jurisprudence, it is manifest that the present separate treatise is the one which he regards as the most ample and satisfactory on the subject.

The work is indeed in all respects well entitled to the attention of the profession. It contains ample and correct information on the poisons of the different orders, gives full accounts of their chemical history, and physiological and pathological effects, and provides the reader with all that accurate and minute information which may qualify him to give an opinion as a medical witness in the case of medico-legal investigations.

The work is divided into eight parts.

The first is on the important and delicate subject of medical evidence in cases of poisoning, to the consideration of which Mr Taylor has devoted fourteen chapters, or nearly one-fourth of the entire volume.

The Second Division of his treatise, Mr Taylor commences by the examination of the Non-Metallic Irritant Poisons, including the Mineral Acids, (chapters 15, 16, 17, and 18); the Vegetable Acids, Oxalic, Tartaric, Citric, Acetic, and Formic, (chapter 19); the Alkalis, Potash, Soda, and Ammonia, (chapter 20); and the Alkaline Salts, (chapter 21.)

Next comes, as Division Third, in chapter twenty-second, the history of the Metalloidal Irritant Poisons, including under this name, Phosphorus, Chlorine, Bromine, Iodine, and Sulphur.

The extensive and complicated subject of the Metallic Irritant Poisons is treated in the following eight chapters, from the beginning of the twenty-third to the end of the thirtieth, inclusive. This forms Division Fourth.

The history of the Vegetable Irritant Poisons is explained in the thirty-first and thirty-second chapters. This is Division Fifth.

In the thirty-third and thirty-fourth chapters the Animal Irritant Poisons are examined at length. This constitutes Division Sixth.

The important subject of Narcotic and Stupefying Poisons is delivered with much knowledge in the six chapters, from the beginning of the thirty-fifth to the end of the fortieth chapter; and that of the Narcotic Irritant Poisons, which is treated in the Forty-first and Forty-second Chapters, may be regarded as concluding the subject. This may constitute Division Seventh.

The subject of Poisonous Gases is examined in the forty-third and last chapter with that attention which its importance at present demands, considering the eagerness with which the questions of drainage and interment within large and populous cities have been for several years agitated. This is Division Eighth.

The work is closed with an appendix, in which are considered several points which could not conveniently, or at the proper place, be introduced into the body of the treatise; for instance, questions relating to Liquid Mercury, Arsenical Poisoning, and Prussic Acid.

The student and practitioner will find in this work a most excellent and well selected body of information on poisons in connection with Legal Medicine.

The Treatise on Medical Jurisprudence is the third edition of the same work, which we had occasion to notice in favourable terms in the sixty-second volume of this Journal in 1844, when it first appeared; and afterwards in the sixty-seventh volume, when it was republished, in the end of the year 1846.*

Mr Taylor has been at very great pains in the present edition of his work, by introducing all the new information from every available source, to maintain its character as an instructive didactic treatise; and it may be justly said to be the most complete treatise on medical jurisprudence in the English language. To the student as well as the practitioner it cannot fail to be a most serviceable guide. No one liable to be engaged in medico-legal inquiries,—and in this position every medical practitioner is liable to be placed,—should be without this volume.

VII.—*A Catalogue of Medical and Scientific Works.* SAMUEL HIGHLEY and SON. London, 1851. 8vo. Pp. 83.

To the respectable firm by whom this catalogue has been published, it is only an act of justice to say, that it is a publication most useful, and one which deserves the thanks of the reading members of the profession.

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* Edinburgh Medical and Surgical Journal, volume sixty-second, p. 245; and volume sixty-seventh, p. 306. January 1847.

The catalogue consists of two parts, one a general list, the other a classified list. In the first part are arranged an alphabetical order under the heads of the names of the authors, all the medical and the principal scientific works that have issued from the press in England during the last twenty years at least. In the second part are given arranged, under the heads of their respective subjects, yet adhering to the alphabetical order, the Essays, Treatises, and Books of different kinds which have been respectively published on each department and on each division and sub-division. This second part bears the marks of having been compiled with great care and much knowledge of medical literature, and the collateral and subordinate sciences. Both parts cannot fail to be of great service to readers. For whatever department any one is pursuing, he may here find in a short time references to books and publications which may render him useful assistance in his researches.

It must not be forgoten that the Catalogue contains a list of all the periodical publications arranged according to the periods at which they appear.

NOTICE OF THE LATE HENRY MARSHALL, M.D.

CIRCUMSTANCES prevented us from doing more in last Number than announcing the death of the late Dr Henry Marshall. But we are unwilling that one whose contributions to this Journal have been so numerous and important should pass away from us without making an attempt, however imperfect, to record the leading features of his character.

HENRY MARSHALL was born at Kilsyth in the year 1775. The Rev. Robert Rennie, who had been minister of the parish of Kilsyth from the 3d of September 1789, and who wrote the old Statistical Account of the Parish in 1796, was the maternal uncle of Mr Marshall,—a clergyman highly esteemed by the parishioners. This gentleman, who was also born in the parish, states that above five hundred persons residing in the parish at that time were his blood-relations. In the year 1762, John Marshall, who possessed the farm of Town-Head, and Henry Marshall of Ruckhill, are signatures to a testimonial or certificate regarding the merits of a particular mode of cultivating potatoes.

Henry Marshall received his professional education at the University of Glasgow, where he had formed, with the late Dr James Jeffray, Professor of Anatomy, a friendship which was continued to the close of the life of that excellent person. In 1803, Mr Marshall entered the naval service as surgeon's mate; but this he soon relinquished, and, in 1805, he was appointed assistant-surgeon to the Forfarshire regiment of Militia.

In the year 1806, Mr Marshall became assistant-surgeon to the 89th Regiment; and with it he served first at the Cape of Good Hope, and afterwards at Buenos Ayres, where General Whitelocke was in command. In the year 1808 he went with the 89th Regiment to Ceylon, an event which early placed him in positions of responsibility. The 89th Regiment was ordered to return to the continent of India, and Mr Marshall was appointed assistant-surgeon to the second Ceylon regiment; but at the same time he did duty as colonial surgeon of a pioneer corps, and occasionally as acting surgeon in charge of the 4th Ceylon regiment.

On the 15th of April 1813, Mr Marshall was appointed Regimental Surgeon to the First Ceylon or Malay Regiment, and, on the 21st December 1813, he was appointed Staff-surgeon, attached, however, still for at least twelve months to the First Ceylon Regiment.

In December 1814, when the preparations for invading Kandy and the interior of Ceylon were actively proceeding, Mr Marshall was attached to the first division of the army destined for that expedition, and, in January 1815, accompanied the forces into the interior. It is well known that this expedition terminated in the deposition of the King of Kandy in February 1815, and the gradual though partial subjugation of the interior to the British government.

After this period Mr Marshall performed duty as Staff-Surgeon in Colombo and Trincomalee till the month of September 1817, when the occurrence of the insurrection and rebellion at Kandy in October of that year rendered necessary very active proceedings on the part of the English authorities; and the duties of Mr Marshall, who was in 1816 Senior Medical Officer, were at the same time proportionally increased in amount and arduousness. Mr Marshall, still in the office of Staff-surgeon and as Senior Medical Officer, continued in Kandy till the month of March 1821, when he embarked for England.

Soon after his arrival in this country, he was appointed staff-surgeon for Edinburgh, where he continued for some time. Subsequently he served at Chatham, and for a longer period at Dublin, from which he was removed for employment on special duties at the War Office. The services which Mr Marshall in this position rendered, led to his promotion to the rank of Deputy Inspector-General of Hospitals in the year 1830, with half pay of the rank. Since that period Mr Marshall resided almost constantly in Edinburgh. He received the honorary title of Doctor in Medicine in the year 1847, from the university of New York; the first instance in which the honour was conferred.

The writings of Dr Marshall are numerous, considering the labour which they required, and the laborious duties in which he was engaged for nearly twenty-eight years of the best period of his life.

The earliest production which he placed before the world was a Memoir on the Cinnamon Tree, which he transmitted from Ceylon to England in 1817 to the Royal Society, to whom it was communicated in March of that year by the President, Sir Joseph Banks.

This memoir, in which Dr Marshall treats of the natural history and the commercial importance of the cinnamon tree and its products, is a work showing great learning and knowledge of the subject, much originality, and immense industry in the collection of accurate facts. A number of errors were prevalent respecting the exact tree or trees from which true cinnamon is procured. Some of these had been fostered by Burman and Linnæus, as well as by more recent observers. These mistakes Dr Marshall corrected so completely, that his descriptions have been followed by botanists in general. He showed that the *Laurus Cassia* did not furnish the cassia of commerce.[*]

One botanist, indeed, was at once obliged to admit the accuracy of Dr Marshall, but in such a manner that seemed to depreciate the value of his description, by saying that Dr Marshall did not aspire to the character of a professed botanist. Dr Marshall might not be a technical botanist, in the sense attached to that term by some persons, but he showed that he was a most correct observer; and if he was not a botanist, his Memoir was only a proof that his merit in writing such a paper was infinitely greater.

The circumstance now mentioned, conjoined with the fact that the original impression contained some typographical errors, led Dr Marshall, in 1839, to publish in the Edinburgh Philosophical Journal an abstract of his paper, with several new facts subsequently obtained.

The only other work of Dr Marshall, which it is requisite to notice in this place is his Description and Conquest of the Island of Ceylon, which was published at London in 1846. This, like all the productions of Dr Marshall, is distinguished for its extreme accuracy. It was criticised, not in a very becoming manner, in a weekly Journal, which, though often containing just remarks on books, probably attempts more than is compatible with its judgments being in all instances well founded. In the instance referred to, the only conclusion that can be drawn is, that the book had either not been read or had been read carelessly. The work of Dr Marshall gives not only a most accurate view of the early history of that island, but a most just and correct account of the circumstances under which it was conquered by British arms. It is also written in an excellent spirit, with much good feeling and benevolence towards the natives. Indeed we know few books more interesting.

The mind of Henry Marshall was distinguished by great love of accuracy and precision, with much originality. No statements of facts would he take for granted, especially where they were likely to be obscured or warped either by their own complexity or by the carelessness of previous observers. On the other hand, with his love of originality his ascertaining new relations of facts and results previously unknown, he had an extreme dislike to all exaggeration. His reverence for facts, especially in those dependent on number, amounted to a species of idolatry. Where a question required to be determined by this sort of evidence, Dr Marshall formed no opinion, but made his judgment in all instances in obedience to the results obtained. In ordinary matters of business, nevertheless, no man could show a greater union of patience in investigating and promptitude in deciding. For soundness of judgment upon all professional matters he was remarkable; while in difficult circumstances his knowledge of the world enabled him invariably to give correct opinions.

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[*] A Description of the *Laurus Cinnamomum*. By Henry Marshall, Esq., Staff-Surgeon to the Forces in Ceylon. Communicated by Sir Joseph Banks, Baronet, G.C.B., F.R.S. Annals of Philosophy, Volume Tenth. October 1817, p. 241; and November, p. 346.

[†] Observations on Cinnamon. By Henry Marshall, F.R.S.E., &c. Edinburgh Philosophical Journal, Volume xxviii., October 1839, p. 27.

Of his moral qualities, integrity and sincerity, kindness and benevolence were the leading features. Scarcely have we known a person of greater or more active benevolence. This it was which led him to devote almost a life-long labour to the reform of abuses in the management of soldiers, to the abolition of the system of force, coercion, and punishment, and the substitution of a rational and mild method of treatment. For Dr Marshall it was a happy circumstance that he lived to witness a complete revolution effected in the course of forty years in the treatment of common soldiers, and that of this revolution his own exertions and writings were the main causes. The good which in this manner his exertions have effected it is now not easy to estimate. But if the soldier of 1806 be compared with the soldier of 1851, some idea may be formed of the effect of the labours of a medical officer, who, to infinite kindness and humanity, united the fortitude end perseverance necessary to realize results. In describing the qualities of the useful regimental surgeon, Henry Marshall delineated by reflection his own character.

We feel the difficulty of doing adequate justice to the merits of this excellent and unassuming man. But it must not be forgotten that no one ever came into contact with Henry Marshall without feeling that he was improved by his conversation and sentiments; and all his friends, we know, feel, that, though dead, he yet speaketh.

The Works not communicated in Volume sixty-seventh are the following.

A Description of the Laurus Cinnamomum. By Henry Marshall, Esq, Staff Surgeon to the Forces in Ceylon. (Communicated by the Right Hon. Sir Joseph Banks, Baronet, G.C.B., P.R.S). Read at the Royal Society in March, 1817. Annals of Philosophy. Volume Tenth. July to December 1817. P. 241 and p. 346.

Historical Sketch of Military Punishment in as far as regards Non-Commisioned Officers and Soldiers. (Sixteen papers published in the United Service Journal between 1838 and 1845).

Historical Detail, relative to the Military Force of Great Britain, from the earliest periods to the present time. By Henry Marshall, Esq. 8vo. pp. 118. (Nine papers from United Service Journal).

These two performances were afterwards embodied in the Miscellany, &c.

Military Miscellany; comprehending a History of the Recruiting of the Army, Military Punishments, &c., &c. By Henry Marshall, F.R.S.E., Deputy-Inspector of Army Hospitals, &c.

Ceylon: a General Description of the Island and its Inhabitants; with an Historical Sketch of the Conquest of the Colony by the British. By Henry Marshall, F.R.S.E., Inspector General of Army Hospitals, c. London, 1846. 12mo, pp. 287.

PART III.

MEDICAL INTELLIGENCE.

I. PHYSIOLOGY.

Influence of Physical Agents on the development of the Tadpole of the Triton and the Frog. By JOHN HIGGINBOTTOM, Hon. Fellow of the Royal College of Surgeons of England. Communicated by THOMAS BELL, Esq., Sec. R. S. (Received April 6. Read May 16, 1850).

An opinion has been generally entertained by physiologists that the tadpole of the frog, when deprived of the influence of light, cannot arrive at its full development, or assume the form of the perfect frog.

Mr Higginbottom made a series of experiments in March and the following summer months of 1848, in different positions and degrees of temperature, but particularly in a rock-cellar thirty feet deep, where no solar light ever entered; this situatiou was also favourable in point of temperature, being

48° Fahr. from March 11th to May 15th.
50° to 54° Fahr. from May 15th to July 6th, and
55° Fahr. from July 6th to October 31st.

The first experiments were performed on the tadpole of the triton.

Exp. 1.—He found the tadpole of the *triton punctatus* more tenacious of life than that of the *triton cristatus*. He placed a number of the ova, enveloped in blades of grass in the manner usual with this animal, in three open shallow vessels containing water. One vessel was placed in a room where the mean temperature was 60° Fahr., another in the open air at a mean temperature of 50°, and the remaining one in a deep rock-cellar at 48°.

In the temperature of 60° Fahr. some of the tadpoles escaped from the ova in fourteen days, those at 50° in twenty-one days, and those at 48° in the rock-cellar in twenty-one days.

Although the tadpoles in the cellar at 48° escaped as early as those out of doors, they did not afterwards increase in growth, whilst those in the room at 60°, and in the open air at 50°, became more developed, the former of these having the anterior extremities in thirty-nine days, the latter in forty-nine days, whilst those in the cellar had no appearance of an extremity at the end of sixty-two days.

Exp. 2.—On the 4th of July a number of the ova of the triton were placed in the rock cellar at its maximum temperature of 55° Fahr. The tadpoles escaped in due time, but, as in the former experiment, they did not proceed in their development, having no appearance of anterior extremities in 105 days, when they died for want of proper food.

Exp. 3.—On the 11th of August he placed twenty four tadpoles of the triton in water, in an earthen vessel enveloped in four or five folds of black calico, so as to exclude the light, the mean temperature of the room being 65° Fahr. The same number were placed under a shed where the mean temperature of the atmosphere was 60°, and a similar number in the deep dark rock-cellar then at a constant temperature of 55°.

In six days several of the tadpoles in the vessel in the room at 65° and in the open air at 60° were dead, and on examination it was found that their branchiæ were absorbed, and their opercula nearly closed. They had died of asphyxia. They then placed a stone in the centre of each vessel, so as to allow the tritons to leave the water as they lost their branchiæ. Two days afterwards the top of the stones had a number of tritons upon them in the vessels in the room and in the open air.

All those placed in the rock-cellar retained their branchiæ, not one having left the water, although stones were placed for that purpose. No more tritons died after the stones had been placed in the vessels, as they afforded them the opportunity of leaving the water when the branchiæ were absorbed.

In about twenty-one days afterwards, during the month of September, two or three had left the water and were on the stones placed in the vessel in the cellar, fully proving that the animal came to its full development in the absence of light, though this development was retarded by the low temperature of 55°.

Exp. 4.—On the 25th of August three tritons, previously deprived one of an anterior, another of a posterior extremity, and the third of the tail, were put into a vessel, enveloped in five or six folds of black-glazed calico so as to exclude the light, and placed it in a dark part of a room where the maximum temperature was 70° Fahr. As it was then the time of the year when the full-grown tritons leave the water, a quantity of clay and flat stones were put in the vessel with a little water at the lowest part, in order to allow them to remain in the water or out of it.

In a month the amputated limbs had undergone the reproductive process; in one a miniature posterior extremity furnished with toes had been formed, in another the tail, and in fourteen days later the anterior extremity and the toes of the third were reproduced.

On the Influence of the Atmospheric Air.

There are three modes of respiration in the tadpole of the frog:—1st, the branchial; 2d, the pulmonary; 3d, the cutaneous.

In the branchial state the body of the tadpole is very small, and at this period they flock to the sides of the vessel in which they are contained close to the edge of the water, nearly exposing the branchiæ to the atmospheric air, the lungs being as yet unemployed.

About a fortnight before the metamorphosis of the tadpole into the frog, its body is very large, and the cutaneous surface for respiration, including the tail, is very considerable; but when the development takes place, the body of the frog is again small, and there is not a sufficient surface for respiration, so that if the animal continues in the water, it becomes asphyxiated. Life then depends more on the pulmonary than the cutaneous respiration.

Mr H. found that the tadpole of the frog soon dies in either aërated or boiled water if excluded from atmospheric air; those in aërated water live the longest; some of them he found at the top of the water, and on examination the lungs were observed to be inflated, whilst those tadpoles in the boiled water sank to the bottom of the vessel. Tadpoles put into boiled water exposed to the atmospheric air live as in aërated water.

2. *On the Influence of Food.*

The food of the tadpole is derived from two sources. The first is the gelatine of the ova, the second the plants growing in the water in which they are deposited.

On the 11th of March 1848, Mr H. put some spawn of the frog, newly deposited, into eight shallow earthenware vessels containing water; in four of them he added grass and duck weed to serve as food for the future tadpoles, in the other four he put none. Mr. H. observed in all the vessels that the tadpoles, after escaping from the ova, had about an equal growth as long as any of the jelly-like substances of the ova remained; but after that was consumed, the tadpoles in the vessels where there was no grass were promptly retarded in their growth.

April 17th.—To prove whether the jelly of the ova was food for the young tadpoles, he separated a number from the jelly, putting the tadpoles in one vessel with water, and the jelly in another.

In thirteen days the tadpoles had not increased in size, and some of them were very weak and nearly inanimate. On this day he placed them all with the jelly. In seven days the jelly was consumed, and some of the tadpoles had much increased in size, others of them had died from having been so long and at so early a period deprived of their first food.

After the tadpole has finished feeding on the jelly, nothing more is required for food than grass and duck-weed, the grass serving for food, the duckweed both for food and as a shelter, and also probably yielding its influence as a living vegetable in the water. The grass is sufficient as food to produce the full development of the tadpole, which feeds upon the chlorophyle which adheres to the cells of the plant, when the plant is in a state of decomposition, leaving the fibrous part. They generally feed on the under part of the plant with the abdomen upwards, owing to the position of the mouth.

The tadpoles were supplied with fresh water every third day, and with grass as often as necessary. In those vessels which were placed in the dark it was necessary to add grass more frequently, on account of the loss of the green colour it sustained in that situation.

They did not feel so well at a low temperature. The life of the tadpole cannot be preserved very long with fresh water and air alone without proper food. A number of tadpoles were placed in eight vessels, of which four were excluded from the light, and four exposed to the light in different degrees of temperature; no food was put in any of the vessels after they had consumed the jelly. On the 11th of May, eight weeks and four days after the deposition of the spawn, the tadpoles remained very small, and the last of them died on that day.

The jelly appears to be quite essential as nutriment to sustain the early life of the tadpole. Had they been deprived of it, they would have died at a much earlier period, as proved by my former experiment.*

3. *On the Influence of Temperature.*

On the 11th of March 1848, in each of four round open earthenware vessels, each containing about three pints of water, and about three parts full was put a small quantity of the spawn of the frog just deposited. The vessels were then placed in four different degrees of temperature.

The first was placed near the ceiling in a shaded part of a room, where the mean temperature was 60° Fahr., six or eight folds of black-glazed calico being tied over it so as to exclude all light.

On the 20th of March the tadpoles left the ova; on the 23d the branchiæ were fully formed; on the 22d of May the first was fully developed at a much earlier period than others placed in a lower part of the same room, exposed to the light at the mean temperature of 58° Fahr., and also earlier than in the pools.

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* According to Mr Brande (Philosophical Transactions for 1810), the jelly appears to be an intermediate substance between albumen and gelatine.

The second was placed at the same time in a situation where the mean temperature was 56°. On the 20th of March, nine days after the deposition of the ova, the embryos were lengthened, indicating the head, body, and caudal extremity, and lay in a curved position within the ova. On the 25th some escaped from the ova. On the 28th the branchiæ were fully formed, and on the 6th of April they were absorbed. On the 22d of May the tadpoles had increased in size. On the 18th of August the first was fully developed.

The third vessel was put within a larger one and placed in the open air, on a shaded side of a house, and entirely covered with wood, so as to exclude all light, the mean temperature being 53° Fahr.

March 20th.—In nine days after the deposition of the ova, the embryos retained their globular form, but considerably increased in size.

On the 25th they had the elongated form within the ova; on the 31st they escaped. On the 4th of April the branchiæ were fully formed, and on the 11th they were absorbed. May 22d, the tadpoles were increased in size. On the 28th of August the first was fully developed.

The fourth vessel was placed in the rock-cellar. The temperature was uniformly 48° Fahr. from the 11th of March to the 15th of May, 50° to 54° Fahr. from May 15th to July 6th, and 55° Fahr. uniformly from July to October 31st.

March 31st.—The tadpoles escaped from their ova on the same day as in that in the open air, the temperature being in the cellar uniformly 48° Fahr., in the open air 53° mean temperature.

On the 6th of April the branchiæ were formed, and on the 18th they were absorbed. On the 22d of May the tadpoles were very small, but from that period to the 5th of September they grew much more rapidly. On the 31st of October the first was fully developed.

It may be observed that when the tadpole in the room was fully developed at the mean temperature of 60° Fahr., those in the open air were small at the mean temperature of 53°, but those in the cellar were smaller still, having been influenced by the low temperature of 48°; from March 11th to May 6th, when the temperature became constantly 55°, they advanced more rapidly in size until their full development.

Soon after November 17th the temperature in the rock-cellar was from 50° to 54° Fahr. for a month, and during that time there were no more tadpoles fully developed. One of them had three legs only; for upwards of three weeks the fourth leg could be seen distinctly under the skin when the animal moved, but it did not protrude.

4. *On the Influence of Light.*

With regard to the question of full development of the tadpole of the frog in the absence of light, Mr Higginbottom states, that it advances in growth equally well in the dark and in the light, and that absence of light has therefore no influence in retarding its development.

Of six vessels with tadpoles, three were exposed to the light in different degrees of temperature, and from three the light was excluded.

At the first he was led to think the absence of light was even favourable to development, but he afterwards found that the difference depended on a slight increase of temperature owing to the vessel being covered. This fact is rendered obvious by the plate, in which the temperature and absence of light are fully illustrated.

These experiments were repeated in the year 1849 with similar results.

NOTTINGHAM, *February* 5, 1850.

II. CHEMICAL PATHOLOGY.

On Urine usually called Chylous. By Henry Bence Jones, M. D., &c. (Philosophical Transactions for 1850. Read 14th March 1850.)

Urine white from the suspension of a quantity of fatty matter in it has been called chylous urine, and the albumen and fibrin which escape from the blood with the fat have been considered to belong to the chyle and not to the blood.

An opportunity of observing a case of this disease having occurred to Dr Jones, he was led to make the following experiments. The conclusions thence deduced are,—

1st. That the fat on which the white colour of the urine depends does indeed appear in the urine after the chyle is absorbed, but the albumen, fibrin, blood-globules, and alkaline salts, may be found in the urine previous to any food being taken, and these substances can be made to appear in, or disappear from, the urine, according as the circulation is hurried by motion or quieted by rest.

2d. That the disease consists in some slight alteration in the structure of the kidney, by which, when the circulation is most active, one or more of the constituents of the blood passing through the filter escape from the vessels into the urine.

The supposition that the disease consists in an accumulation of fat in the blood which is thrown out by the kidneys carrying with it albumen, fibrin, blood-globules, and salts, is altogether disproved, both by actual analysis of the blood itself, and by the frequent occurrence of a large jelly-like coagulum in the urine, when no white fatty matter can be seen to be present.

For an account of the patient, and for the treatment and its ultimate effect in stopping the escape of the white water which he had passed more or less frequently for nine months previous to his being seen by Dr Jones, refer to the Medico-Chirurgical Transactions for 1850.

On the 19th of October, the patient came to Dr Jones, having taken food last at 11 A. M. The water passed at 2 P. M., solidified like *blanc mange* in ten minutes. It contained, when passed from the bladder, some clots ready-formed. It was very feebly acid to test-paper. Thrown on a filter, a very small quantity of reddish streaked fibrin remained on it. The filtered fluid, at 60° Fahr., had a specific gravity = 1015. It coagulated by heat and acid. In appearance it was quite milky, but became clear when agitated with a considerable excess of ether. Some perfectly healthy blood-globules were seen with the microscope, and the granules of fat were so small as scarcely to be resolvable by a high power.

Dr Jones performed a series of careful and elaborate experiments extending over eleven days, during which the patient was in bed and out of it; took food of various kinds, but chiefly a regulated diet; lost blood, and was otherwise under treatment for his symptoms and sufferings.

The general conclusions from these experiments are the following.

1st. That so-called chylous urine may contain fat, albumen, fibrin, and healthy blood-globules.

2dly. That although the fat passes off in the urine after food is taken, yet the albumen, and fibrin, and blood-globules are thrown out before any food has been taken. During perfect rest, the albumen ceases to be excreted, and it does not appear in quantity in the urine even after food is taken, provided there is perfect rest. A short time after rising early, the urine may coagulate spontaneously, although no fat is present in perceptible quantity, and this may happen previous to any food.

3dly. Though the urine made just before and a short time after bleeding was as milky as it usually was at that period of the day, yet the serum of the blood was not milky. It did not contain a larger quantity of fat than healthy blood does. In other respects, except in the diminution of the solids in the serum, the analysis of the blood corresponds with that of a case of cerebral congestion given by Andral.

	Cerebral Congestion.	So-called Chylous Urine.
Fibrin, ...	2·7	2·63
Globules, ...	152·3	159·3
Solids of serum,	105·0	78·1
Water, ...	740·0	759·97

The general results are—

1st. That the most important changes in the urine take place independently of the influence of digestion.

2dly. That the urine in one respect only resembles chyle, and that it is in containing, after digestion, a large quantity of fat in a very fine state of division; but the excess of fat in the urine is not caused by any excess of fat in the blood, for no excess of fat was found there.

3dly. It appears that some change is produced in the kidney, by which fibrin, albumen, globules, and salts, are allowed to pass out whenever the circulation through the kidney is increased; if at the same time fat is present in the blood, it escapes also into the urine.

That this change of structure is not visible to the naked eye on *post mortem* examination of the kidneys, Dr Prout long since demonstrated; and in a case of this disease, which was in St George's Hospital, and was examined at Plymouth, no disease of the kidney was observed. From the total absence of fibrinous casts of the tubes from this urine, it is not improbable that by the microscope a difference may be detected in the structure of the mammary processes rather than in that of the cortical part of the kidney.

On the Variations of the Sulphates and Phosphates in the Urine during Disease. By Henry Bence Jones, M.D. M.A. Cantab., F.R.S. Physician to St George's Hospital. (Philosophical Transactions, 1850. June 13th.)

In two papers in the Philosophical Transactions for 1845 and 1849, Dr Bence Jones showed that in the healthy state on full diet the total amount of sulphates and phosphates in the urine varies.

As regards the total results—

	Spec. grav.
After food from 11·85 grs. of sulphate of baryta per 1000 grs. of urine	1033·9
Before food to 7·93 grs. of sulphate of baryta per 1000 grs. of urine	1026·5
As regards the total phosphates—	
After food from 7·22 grs. of phosphate of lime per 1000 grs. of urine	1030·0
Before food to 7·96 grs. of phosphate of lime per 1000 grs. of urine	1027·9

In the above mentioned paper, Dr Jones gives the amount of the sulphates and the total amount of the phosphates in the urine:—

1. In acute and chronic diseases in which the muscular structures are chiefly affected.
2. In some functional diseases of the brain, as *delirium tremens* and some other forms of delirium.
3. In acute inflammatory disease of the nervous structures.
4. In chronic diseases of the nervous structures.
5. In *acute* diseases in which neither the nervous nor the muscular structures are chiefly affected.
6. In *chronic* diseases in which neither the muscular nor nervous structures are chiefly affected.

In three cases of acute chorea the most remarkable increase was observed in the amount of sulphates in the urine. That this did not arise from the small quantity of urine passed is evident from the small amount of the total phosphates in the urine. Moreover the actual quantity passed, when it could be determined by measure, was found occasionally to be above thirty ounces in twenty-four hours. It is worthy of notice that the amount of urea was also very greatly increased in these cases; so-much so, that on the addition of nitric acid to the urine without any evaporation, nitrate of urea immediately crystallized out.

A very small quantity of food was taken by these patients, whilst the muscular action was most severe; and the contrast between the amount of sulphates when they were recovering and taking full diet, and the amount when they took little food, but were in a state of violent muscular action, is very remarkable.

The general conclusion is, that in acute chorea the amount of sulphates in the urine is increased, whilst the phosphates are in some cases as remarkably diminished.

In five cases of *delirium tremens* the sulphates were found to be above the average. In the 6th case the sulphates are in the greatest quantity ever observed in health or disease. Sulphate of magnesia had also been taken by this patient, so that the amount of sulphates is partly owing to the medicine; but that this is not the sole or chief cause of the increase is proved by the fact that many of the patients with other diseases took the same quantity of sulphate of magnesia, but the sulphates in the urine were never increased to the same amount.

The phosphates, in seven out of the nine cases of *delirium tremens*, were below the average. The same fact was stated in Dr Jones's previous paper, but from the diminution of the phosphates in acute chorea, it becomes doubtful how far this result is owing to the action of alcohol in the system.

Further experiments are required; meanwhile excessive abstinence from food must be admitted as a cause of the diminution of the phosphates in the urine, provided there is no inflammatory action of the nervous structures.

In a case of restless excitement leading to self-destruction, the sulphates in the urine were found to be increased, and the same thing was also observed with a diminution of the phosphates in a case of delirium and phthisis.

In acute inflammatory diseases of the nervous structures, during the most febrile symptoms, an increase was observed in the amount of sulphates in the urine, and the total amount of earthy and alkaline phosphates in these diseases appeared to be increased in the same proportion as the sulphates were increased.

In some slight and chronic diseases of the nervous structures, no increase in the amount of sulphates in the urine was observed, excepting when sulphate of magnesia had been taken as a medicine.

In acute diseases, in which neither the nervous nor the muscular structures were chiefly affected, no increase in the sulphates or phosphates was observed, except after sulphate of magnesia.

In chronic diseases, in which neither the nervous nor the muscular structures were chiefly affected, no decided increase in the suiphates or phosphates in the urine was observed, except after sulphate of magnesia. One case of exostosis may be regarded as a doubtful exception to this statement.

The general conclusions are—

1. That in acute chorea, in which the muscles are in excessive action, the sulphates and urea in the urine are greatly increased.

2. That in *delirium tremens* the same state of urine is frequently met with; that in these diseases the phosphates are not at all increased.

3. That in acute inflammation of the nervous structures, sulphates and phosphates are both increased in the urine.

4. That in chronic diseases of the brain, and that in other acute inflammations and diseases, and in other chronic diseases, no increase in the total amount of sulphates is observed, excepting when sulphate of magnesia is taken as a medicine.

The result of this investigation is that—

Muscular action increases the sulphates in the urine without increasing the phosphates; whilst

Inflammation of the brain increases both the sulphates and phosphates in the urine.

On the Influence of Tartrate of Ammonia and of Carbonate of Ammonia on the Acidity of the Urine. By Henry Bence Jones, M. D., M. A., Cantab., &c. (Philosophical Transactions, 21st June 1850.)

In a previous paper and appendix on acidity of the urine, published in the Philosophical Transactions for 1849, Dr Jones showed the effect of different diets, of sulphuric acid, of tartaric acid, of caustic potash, and of tartrate of potash, on the acidity of the urine. In the above paper, Dr Jones traces the effect of tartrate of ammonia and of carbonate of ammonia.

III. (*e.*) The effect of tartrate of potash having been so remarkable it was thought that by observing the effect of tartrate of ammonia, some conclusion might most rapidly and decidedly be obtained as to the comparative effect of fixed and volatile alkalies on the acidity of the urine.

From a series of fifteen experiments performed during a space extending over many days, the following conclusions are deduced.

First, that there is a very great difference between the effects of volatile and fixed alkalies on the acidity of the urine; *secondly*, that carbonate of ammonia, in large doses, does not diminish the acidity of the urine; *thirdly*, that carbonate of ammonia, in large doses, actually increases the acidity of the urine; and this was evident, not only in the acidity not falling so low as it did after food when no carbonate of ammonia was taken, but in an actual rise before food to a higher degree than was reached when no carbonate of ammonia was administered.

The conclusions from these experiments with tartrate and carbonate of ammonia may be shortly stated thus—

(*e.*) That tartrate of ammonia in large doses produces no effect on the alkalescence of the urine. It differs entirely in this respect from tartrate of potash.

(*f.*) That carbonate of ammonia in large doses increases the acidity of the urine.

III. SURGERY.

1. *Case of Popliteal Aneurism treated by Compression.* By O'Bryen Bellingham, M. D., &c., Surgeon to St Vincent's Hospital, Dublin. Communicated to the Medico-Chir. Society on Tuesday, 10th June 1851.

A labourer, aged forty-two, was admitted into St Vincent's Hospital under Dr Bellingham's care in November 1850. The aneurism, which was of large size, was seated in the right popliteal space, had a strong heaving impulse, and a short harsh murmur was heard on auscultation. The treatment was commenced by placing the patient upon a very restricted diet, particularly as regards fluids (six ounces only being allowed in the day, with eight ounces of solid food), confining him strictly to the horizontal posture, with a dose of purgative medicine each night. Under this treatment, continued for some days, the pulse, from being hard and incompressible, became soft, small, and slow.

Compression was commenced December 4th, at eleven A. M., by means of two instruments, one upon the artery where it crosses the ramus of the *os pubis*, the other at the lower third of the thigh. At half-past eight P. M, the outlines of the aneurismal sac were more distinct; the patient's skin was cool, and he did not complain of pain. He remained awake during the night, and kept up the compression himself; the points upon which the pad of the instrument should rest having been marked with ink. Next morning, between nine and ten, on unscrewing the instrument, the pulsation of the aneurism was found to have ceased; the tumour was hard, solid, and circumscribed, and an enlarged collateral vessel was felt over the centre of the popliteal region. Moderate pressure was continued for some days; the patient was kept in bed, and the diet was gradually improved. The tumour diminished in size and became harder; and when the patient returned home, the limb was as strong as the other, and his general health perfectly good.

The author contrasted the results of compression and the ligature, and pointed to the advantages likely to ensue from combining constitutional with local treatment.

In a table appended to the paper, the author has given a list of all the cases of external aneurism treated by compression in Dublin during the last seven years, in which the seat of the disease is mentioned, the hospital or other locality where the treatment was conducted, the surgeon's name who had the management of the case, and the results were stated.

2. *Dissection of a case in which two Popliteal Aneurisms had been treated by Compression of the Femoral Arteries.* By P. HEWETT, Esq.

A man, aged thirty-eight, was admitted into St George's Hospital, in the middle of 1848, under Mr Cutler, with an aneurismal tumour in each popliteal space. That on the right side, completely filling this region, was compressible, but could not be emptied; that on the left, not larger than a small egg, was hard, and to a great degree apparently solid, and with much less pulsation. The tumour on the right side had only existed three months, and nothing had been done for it. From the account of the patient, it appeared that the disease on the left side, which had begun about eighteen months back, had been treated by compression of the femoral artery, at the Wexford Infirmary, where the pressure had been kept up, more or less, for seventeen weeks. During this time the limb had regained its natural size, and the tumour was reduced to its present state, from which it had never since varied, and had caused him but little inconvenience. His general health, which had begun to give way about two years and a half back, had prevented him from following his business of musical instrument maker. When admitted into the hospital, he was pale, and apparently suffering from great debility.

At a consultation of the surgeons, it was determined, under existing circumstances, that compression should first be applied to the right femoral artery; and the instrument, a ring tourniquet, was so adapted as only to lessen the circulation of the limb, and to be worn for a few hours daily. In some little time the limb was reduced in size, and the tumour became smaller and firmer; but pulsation still remained. Some six weeks after his admission, and whilst he was under surgical treatment, cough and expectoration, with difficulty of breathing, made their appearance. Auscultation detected nothing abnormal about the heart, but the lungs were found to be engorged at the back part. The chest symptoms went on increasing in severity; and the patient one day suddenly brought up a large quantity of arterial blood, and died shortly afterwards. The tumour in the right ham had gone on decreasing in size, and had become firmer and more solid; but some pulsation was still felt. No change had occurred in the left ham.

At the examination of the body, which took place thirty-one hours after death, the left aneurismal tumour, deeply imbedded in the popliteal space, was found lying between the joint and the artery, of the size of an egg; it was pyriform in shape, and apparently quite solid; but on cutting into it, the lower half only was filled with long-standing coagula; the upper part, still presenting a cavity lined throughout by a perfectly smooth membrane continuous with the coat of the artery, merely contained some small recent clots. Of the two openings into the sac, the upper one was large, and nearly of the size of the artery; the lower one, on the contrary, was much contracted, and scarcely admitted a common-sized probe. The portion of the artery lying upon the sac was also very much contracted, but its coats were healthy, as well as those of the posterior and anterior tibial vessels, which were of their normal size. In the upper part of the popliteal, and in several parts of the femoral, there were large patches of atheroma, with three distinct aneurismal dilatations, one in the former vessel and two of the latter. The femoral artery and vein were pervious in their whole length, and the surrounding cellular tissue was not thickened. The vein and the nerve in the popliteal space were firmly adherent to the sac, with a few of the fibres of the gastrocnemius muscle.

The aneurism on the right side, larger than a cricket-ball, was also lying between the artery and the knee, to which it was firmly adherent. It was filled with laminated coagula, except at the back part, where there was still a small channel leading from the upper into the lower part of the vessel; this channel was rough throughout, and covered with recent fibrine. The upper opening of this channel was free and smooth; the lower one was small, and below it the artery was reduced to the size of the posterior tibial. Above the aneurism, the coats of the artery were much thickened by atheroma; and here too, about an inch and a-half above the tumour, was another small aneurismal dilatation. The femoral artery presented several patches of atheroma; but it was otherwise healthy, and, as the vein, pervious throughout its whole course: the surrounding cellular tissue was not thickened. With regard to the popliteal vein and nerve, the appearances were the same as those observed on the left side.

The thoracic aorta was extensively affected with atheroma throughout a great part of its course, and it was somewhat dilated. In its arch, it presented three distinct aneurisms, one of which, the largest, was lying between the large vessels and the windpipe, into which it had burst by a small ulcerated opening about an inch above the bronchi: the cavity of this sac was partly lined with long-standing coagula. The bronchi were filled with blood, in addition to which the lungs themselves presented several large patches of pulmonary apoplexy, and were extensively affected with emphysema.

All the abdominal organs were healthy, excepting the kidneys, which were somewhat smaller than natural, rough on their surface, and with several small cysts in their structure.

In the discussion which followed various members delivered their opinions.

Mr Partridge was inclined to think that the London surgeons were open to the remark of Dr Bellingham, of having neglected the plan under consideration. In King's College Hospital, pressure had been but little employed, and the result was by no means encouraging. This was partly attributable to the imperfect instrument employed, and partly to the circumstance of the patients being entrusted a good deal with the treatment themselves. Thus a stout healthy-looking man was admitted into the hospital with a popliteal aneurism, and the management of the instrument was mainly left to himself. He screwed up the instrument so tightly that it eventually broke, but not until a large slough formed on each side of the aneurism, which remained in the same state. A ligature was afterwards applied; the man lost his toes by gangrene, but the aneurism was cured. If he (Mr Partridge) had such an instrument as that exhibited on the table, he should use it, as it was a great improvement on the one usually employed in London. He inquired the experience of surgeons on the state of the artery after compression had been employed unsuccessfully; it having been urged by some that the artery, after the failure of compression, was not in so favourable a condition for the application of a ligature as before.

Mr **Quain** had observed good results from compression in a few cases of popliteal aneurism, and he was favourably disposed to that treatment. He feared that a portion of the remarks in the paper first read were not calculated to conciliate support to the practice it advocated; he alluded to the remarks made in connexion with the statement that surgeons out of Dublin "decry" compression as a mode of treating aneurism. This statement, too, he believed to be erroneous; at least he had not heard anything that would bear it out. But the question really was not, what is thought in Dublin, or in Edinburgh, or in London, but what was the fact as to the utility of compression in the management of the disease? While he listened to the paper, he was struck by the circumstance that no mention was made of the treatment in question being resorted to in aneurisms, other than the popliteal and femoral. He (Mr Quain) had seen the late Mr Liston use compression of the brachial artery in a case of aneurism of the hand from injury. Though the compression was made under favourable circumstances (for it was well applied, and the patient gave every aid to the surgeon), still it entirely failed. The disease in this instance was cured by ligature of the brachial artery. In the operation, this artery was by no means so easily secured as it usually is, owing to the thickening of the cellular substance and fascia by the compression; but there was no such difficulty in the case as would justify, in his opinion, any opposition to the use of compression upon that ground. He thought, at the time, that the want of success in this instance might perhaps have been attributable to the large nerve which courses over the brachial artery. The femoral artery, it would be remembered, has no nerve in of magnitude in company with it.

Mr **Partridge** said that the statistics should state whether the patients were cured or not, and how long they remained well. Dr Bellingham was right in saying that in London we did not habitually employ pressure, and that there must be some reason for it.

Mr **Quain** had seen compression employed successfully in cases of femoral and popliteal aneurism, but at the moment he did not recollect the number of cases.

Mr **Prescott Hewett** differed from Mr Partridge respecting the employment of compression by London surgeons; at all events, he could speak for St George's. During the last three or four years, there had been five cases of aneurism in the hospital, including the one detailed in the paper before the Society. Two of these were cases of popliteal aneurism, one of which was of very large size. In both cases, compression was applied to the femoral artery, but owing to some peculiarity in the patient, compression was discontinued, and the artery was ligatured, and both did well. The instruments employed were not so clumsy as had been represented: in both cases, compression was kept up by two tourniquets in two parts of the artery. The patients were under the care respectively of Mr Cæsar Hawkins and Mr H. C. Johnson. In neither of the cases did the effects of compression render the application of the ligature more difficult. The third case was one of diffuse aneurism of the ulnar artery, consequent upon a wound; in this case the tourniquet was applied over the brachial. He did not think that the failure in Mr Liston's case of aneurism in the hand was attributable to the contiguity of the nerve to the brachial artery; for, in the case in St George's, the pressure was applied over the brachial, and the patient was cured in a fortnight. In the fourth case, compression was tried, and acted apparently with good effect; but in two or three months the pulsation was again detected; the patient was unwilling to submit again to pressure; the artery was consequently ligatured, and a cure effected. The fifth case was the one related in the paper before the Society. In answer to Mr Partridge respecting the influence of compression on the after operation of ligature, he might say, in the case operated on, there was no thickening of the sheath surrounding the vessels.

Mr Curling would have no disinclination to try compression when a suitable case presented itself. It was a valuable plan of treatment; and the Society was indebted to Dr Bellingham for bringing it forward. The instrument on the table was not sufficiently known in London. He thought that in cases of compression on the femoral artery, obliteration of the vein, as in the case mentioned by Mr Quain, might be avoided by having the pressure applied either just above or below Poupart's ligament. The instrument required management. Where did Dr Bellingham apply pressure on the femoral artery? He thought Mr Quain's observations respecting the brachial artery would be borne out by other cases. The pain would be very severe from pressure upon the nerve.

Mr Cock said that his experience of pressure was limited to two cases of popliteal aneurism. In these cases, the only reason he believed the plan did not succeed was, that the patients did not persevere in the employment of the means—one discontinuing it in four, the other in six days. There was no reason to doubt that if the patients had gone on they would have got well. The instruments employed in Guy's Hospital were by no means so perfect as the one on the table, and were more irksome. In each of the cases to which he had referred, the femoral artery was tied at the urgent request of the patient. Both patients got well; but in one case the operation was rendered somewhat more difficult from some thickening and inflammation of the sheath of the vessels. Beyond this, the pressure had not interfered with the application of the ligature. He (Mr Cock) had no doubt that the failure of the pressure in these cases, and the inability of the patients to bear it for any length of time, had arisen from the clumsy character of the instruments, and the bad manner in which they had been applied. The patients in these cases had not been sufficiently watched, and were seen only daily or every second day. Much more watching and care was required in the proper management of these cases than were usually bestowed on hospital patients, and to a neglect of these the failure in the cases he had related might fairly be attributed, as well also to the neglect of instructing the patient carefully in the mode of applying the pressure. He thought, however, that pressure in the treatment of aneurism would soon be much more extensively employed in London than it had been.

Mr Hodgson hoped that if Dr Bellingham were in the room, he would give some further particulars of his mode of treatment. He thought the profession in England were very much indebted to their Dublin brethren for the great attention they had bestowed on the treatment of aneurism by compression, and to the improved method they had carried out. They had rendered compression much less irksome by the form of apparatus which they employed, and their substitution of an elastic material, like India rubber, for an inelastic one. Another point alluded to was the application of pressure at two distinct points, so that pain and weariness might be prevented by changing the place of pressure.

Dr BELLINGHAM referred to some casts on the table of a limb taken before and after pressure had been applied to it to cure aneurism. In one case, a popliteal aneurism was cured in twenty-four hours; but an aneurism of the opposite side presented itself, and took a much longer time to cure. The patient eventually died from aneurism of the descending aorta. The artery over which the pressure had been applied was found quite normal; the aneurism was obliterated; the vein was normal. In another case, in which pressure had been applied to the femoral artery for popliteal aneurism, galvanic punctures having been also employed, the patient had died at the end of ten days from erysipelas. The aneurism was found nearly filled by layers of fibrine; the artery under the seat of pressure was healthy. He had dissected a patient who had suffered from aneurism in both popliteal arteries. One of these was treated by compression, the other by ligature. The latter returned at the end of three or four years; not so the former. The vein and artery were found healthy. It was difficult to apply pressure to the femoral artery without involving the vein in the compression. In almost every case which he had treated by compression, the pressure had been made at two or more points. He begged to say that his observations referred to the Edinburgh surgeons; not to those of London, on whom he had no cause to reflect. In the list of cases which had been alluded to in the reading of the paper (but had not been read), instances were recorded in which the radial artery was the seat of aneurism, and which had been cured by pressure made on the brachial artery.

Dr BELLINGHAM sat down amid much applause.

Case of Femoral Aneurism in the Female treated by Compression.

By WILLIAM HARGRAVE, M. B., Professor of Surgery to the Royal College of Surgeons, Surgeon to the City of Dublin Hospital.

THE rarity of external aneurism in the female, particularly in the femoral and popliteal arteries, is most remarkable. In fifteen cases of these two aneurisms recorded by Hodson, fourteen were in the male, and only one in the female; during forty years' practice, but eight cases of popliteal aneurism were seen in the female by Sir A. Cooper, but three by Guthrie; and my colleague in the College of Surgeons, Dr Porter, who has had much experience in this disease, never saw it but in this instance.

From every examination, this case presented the characters of diffused false aneurism, the result of direct injury. This form is considered more difficult of treatment, either by pressure or by the ligature; in it there is always less tendency for the blood to coagulate than in the false circumscribed variety.

Some difficulties were encountered in the treatment; the pressure could not be applied on any part of the thigh, owing to its being full, soft, and flabby, offering no support or counter-resistance to the instrument, unless it was carried to its *maximum* to arrest the pulsation in the tumour, and which could not be endured, when tried, but for a very short period: it also caused the aneurism to be more distended, and the limb to be considerably congested. I was then compelled to select the inguinal region, which was not a very favourable site for compression, as there was not only a small enlarged lymphatic gland close to the artery, but also the remains of a cicatrix occupying nearly the entire length of the groin, which rendered the patient very sensitive to pressure, so that it could not be borne continuously for any length of time. In the commencement of the treatment she was rather refractory, being under the impression that her disease was of but little consequence; but when informed of its true character, for the cure of which, if this mild treatment failed, she must submit to a severe operation to save her limb, if not her life, she then endeavoured to second our efforts. Still the pressure was by no means so effectively continued as could be wished.

She was under treatment for twenty days, that is, from the first application of the compression until all pulsation had ceased in the tumour, during which period the absolute pressure did not amount altogether to more than 134 hours, or five days and a half.

The only suggestion I can make in the use of the instrument now rendered so complete by Dr Carte, both as to its perfect adjustment and gradation of pressure, is to change the pad when it becomes roughened by use; for when it acts so as to fret the skin, it is productive of more irritation and annoyance to the patient than the actual pressure itself; or, in other words, that the pad should always preserve *a perfectly smooth surface.*

During the treatment of the case, it cannot be too strongly impressed upon the attention of the surgeon, to avoid much handling of the tumour and of the limb; in fact, to eschew meddlesome interference, which will invariably delay and derange the sanitary processes going forward in the aneurism.

I have condensed the case as much as possible from the full and accurate notes of it taken by Mr M. O'Connor, the house-surgeon, who zealously devoted himself to carry out all my wishes with untiring attention.

I may also observe that Sir B Brodie, in his late visit to this city, had the opportunity of satisfying himself of the efficacy of this treatment, by examining this patient when in hospital.

Harriet L., dress-maker, aged twenty-three, unmarried, of full habit, admitted into the City of Dublin Hospital, June 22, 1850; she says that her general health previously was good. On examination, a large pulsating tumour was observed to occupy the lower part of her thigh, for six inches above the patella, and extending spirally backwards and downwards as far as the head of the tibia; the exact shape of the tumour could not be ascertained, but it appeared to be irregularly quadrilateral, longer in the vertical than in the horizontal direction; the upper part best defined and most prominent. There was no discoloration of the integuments over it; temperature natural; leg flexed at an obtuse angle on the thigh; outline of the patella lost, and natural shape of the joint destroyed. Three inches above the patella, the circumference of the limb was 17½ inches, and round the patella 16½ inches; the corresponding parts on the opposite limb measured respectively 16½ and 14½ inches. A distinct bruit, best marked in the upper part, was audible all over the tumour synchronous with the systole of the heart.

She first observed the tumour about four months before admission; since then it had been constantly increasing in size. The only cause she could assign for it was a hurt she received from a door; she was in the act of running out of a room, when some person, in play, forcibly shut the door, and caught her thigh between it and the frame. About a week subsequently to this, she perceived a small tumour, of the size of a marble, in the place where the sharp edge of the door had struck her; this part she now points out as the upper and most prominent portion of the tumour. It gradually and steadily increased; she describes it as having pulsated from the beginning, and compares the pulsation to the ticking of a watch; it was this that first directed her attention to it. When it became as large as a walnut, the pulsations were so strong as to lift the thigh and leg off when placed across the opposite one; as the swelling increased the leg became benumbed, and, before admission, it was often blue and cold, and slightly œdematous. The whole limb was affected with painful twitchings, which generally occurred during sleep, and lasted for an hour each time. On admission, the tumour could be diminished by making firm pressure on it, at the same time compressing the femoral artery, *but this diminution was very slight.* The pulsations were synchronous with those of the heart; indistinct fluctuation could be perceived.

June 27th.—Compression was commenced at 5 o'clock in the evening, with Dr Carte's circular compressor, in the inferior part of Scarpa's triangle, and, although causing intense pain, borne for forty minutes, when it was relaxed; it was re-applied at a quarter before 10, and continued untill 11 o'clock, and borne without much inconvenience. The pressure was then relaxed for a few minutes, and from twenty minutes after 11 until within five minutes of 12 o'clock, pressure was again used; again from half-past 12 to 1 o'clock, A. M., "when she complained of sickness in the stomach, and trembled violently: the instrument was then removed from the limb." She was ordered twelve drops of *acetum opii* and fifteen drops of compound spirit of ammonia in cinnamon-water, to be taken immediately.

June 28th.—Tumour evidently more solid, the sub-fluctuating fell less perceptible; ice was directed to be applied over it. The circular compressor was now laid aside, and the pelvic compressor, as invented by Dr Carte, was substituted for it, and made to act on the groin. During this day pressure was made at various periods, and a very trifling amount was sufficient to arrest completely the pulsation in the aneurism.

June 29th.—This morning the circumference of the thigh over the tumour was 17⅞ inches; during the evening of this day it is noted, when the pressure was removed from the artery, she instantly complained of intense pain shooting along the leg. On renewing the pressure the pain was relieved, and replaced by a burning sensation, around the knee-joint, which ceased in about two minutes. She suffered from sickness of stomach, and vomited frequently. Ordered an effervescing draught, with two minims of hydrocyanic acid.

July 1st.—Tumour seems firmer to day; still no very decided change. Two instruments were applied this day; she complained of the one next the tumour very much; it did not control the pulsation, and it was then finally discontinued, and pressure on the pubis alone confided in, which was used at intervals.

July 2d.—During the evening, after irregular trials of pressure, when removed from her bed to have it made, it is noted that she experienced an excruciating attack of pain, which she referred to the internal and external sides of the knee, and which was in a short time relieved by pressure on the femoral artery, and the application of cold to the thigh.

July 3d.—The compressor was used but at intervals, and she slept soundly for about four hours; towards night she again complained of extreme pain around the knee-joint, extending down to the toes; she had an opiate of twenty minims of *acetum opii.*

July 4th, 5th, 6th.—Nothing worthy of note during these days, except the return of the nocturnal pains about the knee, thence extending along the anterior part of the leg, but of shorter duration than on the previous days.

July 7th.—The impulse and bruit in the aneurism are much less than on yesterday; she is more tolerant on pressure. It was observed that the pulsations of the abdominal aorta are remarkably strong, particularly in the umbilical region; there is no hypertrophy of the heart, nor any evidence of disease in it or the aorta. During this day the instrument was applied continuously for at least four hours.

July 8th.—This morning the tumour appears smaller, the pulsation less distinct, and an indistinct murmur is heard in addition to the bruit before described, which shortly after became inaudible.

July 9th.—Fulness in the ham increased; she suffered much pain in and around the knee last night; pressure irregularly effected this day.

July 10th.—Compression borne for seven hours.

July 11th.—No change; the instrument used for eight hours.

July 12th.—No compression during the past night, as she had several rigors, with sickness of stomach, but no vomiting. Ordered effervescing draughts with hydrocyanic acid. Noted, "that she slept well all the day, and is sufficiently well to bear pressure, which was applied for about one hour during the evening. Slight ecchymosis observed on the surface of the tumour, and the superficial veins are seen ramifying over it. Circumference of the thigh over the aneurism 17¾ inches."

July 13th, 14th.—Pressure was made for three hours on the latter day, but imperfectly. Ordered a draught of rhubarb and sulphate of potash, which acted once on the bowels.

July 15th.—Pulsations much weaker; the circumference of the thigh 17½ inches; the instrument applied for four hours and a-half.

July 16th.—The ecchymosis is better marked and more diffused; pressure for five hours.

July 17th.—Last night, about ten o'clock, she was attacked with a most violent pain which lasted for nearly an hour; her screams could be heard outside the hospital; she referred the pain chiefly to the anterior part of the leg, extending on both sides of the tibia to the ankle; a belladonna plaster along the site and course of the pain gave her relief; the instrument has not been applied; the tumour has increased since yesterday, the circle being 18 inches in circumference. Last night, after the pain had ceased, the slightest pulsation could not be perceived in the aneurism, either with the hand or ear; it, however, returned in a quarter of an hour; pain quite gone to-day.

July 18th.—Pressure was applied for six hours during the day; at 8 o'clock P. M., the pulsation completely ceased; pressure was continued during the night. When examined in the morning, no pulsation could be detected in the aneurism, the whole tumour presenting a remarkable solidity.

July 20th, 22d, 23d.—No pulsation; the discoloration fast fading away, and the limb becoming smaller; pressure still kept up at intervals. On the sixteenth day, after the pulsation had stopped, she was permitted to sit up, and in two days after to leave her bed and walk about the ward. A progressive diminution has taken place in the bulk of the aneurism, so that on the twentieth day, after all pulsation had ceased, the limb is nearly as well-shaped and symmetrical as the other. She continued daily to improve from this time, the limb becoming stronger and its temperature increasing, and the tumour diminishing and presenting more solidity.

Sep. 6th.—She was discharged frem the hospital, the limb natural in size and temperature, a part of the tumour remaining unabsorbed.

She was brought into the hospital the night following, in a state of great excitement from intoxication and pain; the limb was greatly swollen from above the knee down to the ankles, and very hot; she screamed violently, and she felt as if her leg had burst, referring to the calf of the leg as giving most pain. It appears from her account, that she had been in the Park all the day (Saturday), that she had walked a considerable distance, and jumped across a stream; that she went to the theatre in the evening, and, returning from thence, drank six glasses of brandy; she remembers nothing further.

For four or five days subsequently to her re admission into the hospital, she suffered much from pain in the calf of the leg, the temperature of which was considerably lower than that of the other leg. The application of a flannel roller from the toes to the middle of the thigh was all the treatment that appeared necessary; she gradually got well, and was finally discharged from the hospital on September 24th, at her own request; the limb being in function and appearance as perfect as the other.

IV. MISCELLANEOUS.

In the foreign papers the death of Lorenz Oken, Professor of Natural History in the University of Zurich, is announced to have taken place in that city on 28th August 1851.

Lorenz Oken died at the age of seventy-three, having been born in 1778.

Oken was originally intended, it is said, for the profession of medicine; that is, he studied in a desultory manner, as was then the custom, anatomy, physiology, chemistry, and some natural history, at Jena, during the latter years of the eighteenth century. At this time the peculiar opinions and doctrines which distinguished the philosophy of Schelling were fashionable, and attracted much attention among those who endeavoured to apply to the physical and physiological sciences principles of philosophy. Among those who adopted and endeavoured to explain and illustrate the doctrines of Schelling, Lorenz Oken was eminently conspicuous. In 1802 he published a short tract, entitled Outlines of Natural Philosophy, in which he proposed a new Classification of the Animal Kingdom, resting principally on the idea, that each class is the representative of a particular organ of sensation. It was impossible that so violent an assumption could be generally adopted; and though various facts seem to favour the idea that one sense is more strongly developed and more predominant in its operations than others, yet the system so proposed never made a general or strong impression upon naturalists and zoologists.

In 1805, Oken published a work on Generation, in which, amidst many fancies and hypothetical notions, he announced the idea that all the parts and tissues of animals and plants are originally cells or vesicles; the idea that has derived so much weight from the subsequent confirmation by Robert Brown in this country as to plants, and by Schleiden as to plants, and Schwann as to the animal tissues in Germany. It is not easy to say, whether this was merely a happy guess, or a notion elaborated by observation and reflection. The notion has been in different forms, and at different periods of science was more or less distinctly brought forward by different authors; Malpighi, Grew, Haller, Buffon, Bordeu, Treviranus; but it was never established as a fact on stated grounds till the paper of Schleiden appeared in Muller's Archives.

It is well known that the work which has been allowed to show most decidedly the genius of Oken is his Essay, published at Bamberg in 1807, on the Signification and Nature of the Bones of the Skull, in which he undertook to prove that each separate cranial bone is, or represents a vertebra. This notion, which unites the advantage of being at once striking, and subsequently plausible, was adopted more or less strongly by many speculators in transcendental anatomy; first among the Germans, and subsequently by some of the French anatomists. It was supported by Geoffroy St Hilaire; but it never received from Cuvier that degree of countenance which is requisite to show its versimilitude. It has subsequently been more fully and accurately explained and applied by Mr Owen, with those conditions and limitations which are probably requisite to its safe application, It remains, nevertheless, yet to be seen whether the idea promulgated by Oken is one of those which are entitled to be ranked among the general principles of the science of animal organization.

In the course of the same year, namely, 1807, he published at Bamberg, in association with D. G. Kieser, Contributions to Comparative Zoology, Anatomy, and Physiology,—a work of which we believe only two numbers appeared.

In 1810, Oken published his Physico-Philosophy, a great work, with not a few blemishes and defects. Like all his writings it bears the marks of genius, and shows the effects of fanciful and excessive generalization. Of this work an English translation was published in 1840 by the Ray Society.

Many separate papers and memoirs on Geology, Zoology, Botany, and Physic in general, has Oken written. He was editor of the Isis, a very excellent philosophical and scientific journal, published for a long time at Jena, where he was at an early period Professor of Natural Phylosophy. Subsequently he became professor of the same science at Munich.

During the political dissensions that arose in various German States in 1842-43, Oken took part with the discontented side; and having expressed himself as to the points in dispute with a degree of freedom which was offensive to the Bavarian government, he found it expedient to resign his office. He was subsequently appointed to a similar situation in the University of Zurich.

To Oken is generally ascribed the idea of assembling the scientific persons of Germany in annual general meetings; an example which has in this country given rise to the British Association, and which has been so successfully imitated in the annual meetings of that body.

The character of Oken presents an example not very inaccurate of the usual type of German intellect. That he was possessed of genius with several of its highest qualities, it is impossible to deny. But the genius was mixed and depreciated by not a few of the usual defects of the German mind. Fancy and imagination, wild and little restrained by judgment, the talent of seeing in a few facts innumerable applications sometimes just and practicable, more frequently quite hypothetical, if not chimerical, striking and original ideas, which may or may not be true, but which are almost in no case capable of demonstration; such nearly seem to be the leading characteristics of the intellect of this eminent philosopher. His genius was his own; its aberrations were the effect of the system of education in German universities, and the peculiar circumstances in which scientific men in Germany are placed. Had Oken received his education in an English or Scottish university, he might not have written works containing notions so original. But his doctrines would have been more carefully considered; they would have been brought forward with the necessary limitations and conditions; and they would have been more closely adapted to nature, and more seviceable to society.

Died on Wednesday, 17th September 1851, at his residence, St Giles's Street, Oxford, after a few hours illness, John Kidd, M.D., of Christ Church, Regius Professor of Medicine, Tomlinis Praelector of Anatomy, Aldrichian Professor of Anatomy, and Radcliffe's Librarian.

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No **190** *will be Published on the* **1st** *of January* **1852.**

ROBERT INCHES, PRINTER, OLD ASSEMBLY CLOSE, EDINBURGH.